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# AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

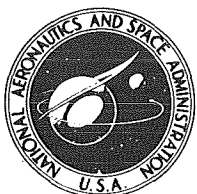
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NASA SP-7011 (73)

# AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY  
WITH INDEXES

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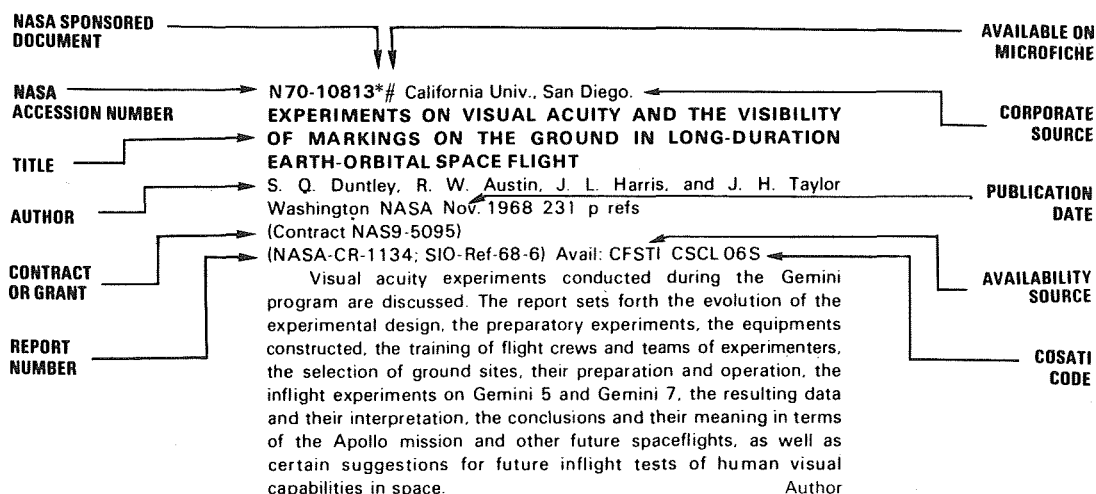
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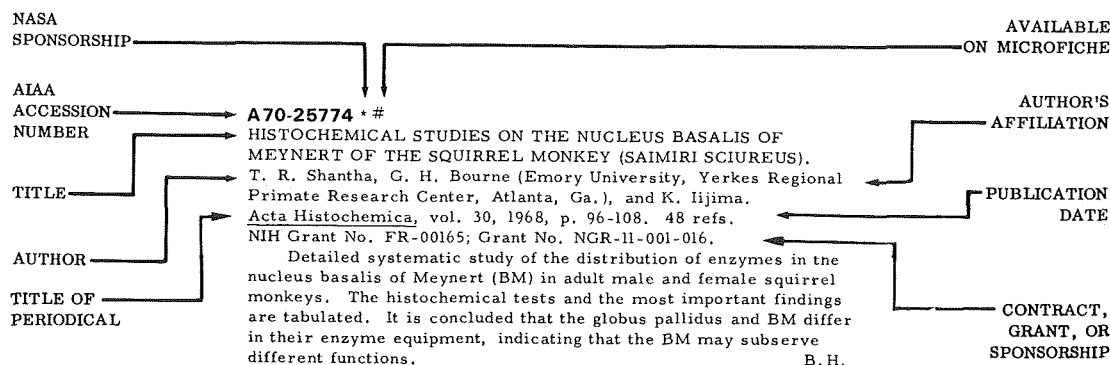
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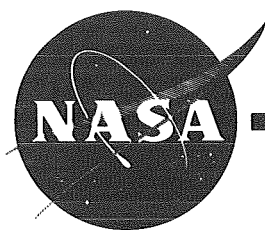
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# AEROSPACE MEDICINE AND BIOLOGY

*a continuing bibliography*

FEBRUARY 1970

## STAR ENTRIES

**N70-10001\*** Minnesota Univ., Minneapolis. College of Medical Sciences.

**DEVELOPMENT AND EVALUATION OF AN IMPEDANCE CARDIOGRAPHIC SYSTEM TO MEASURE CARDIAC OUTPUT AND OTHER CARDIAC PARAMETERS, 1 JULY 1968 - 30 JUNE 1969**

William G. Kubicek, D. A. Witsoe, R. P. Patterson, and A. H. L. From 30 Jun. 1969 465 p refs Presented at 1st Symp. on Impedance Cardiography, Houston, Tex., 2-4 Jun. 1969 (Contract NAS9-4500)

(NASA-CR-101965) Avail: CFSTI CSCL 06E

The papers presented pertain to the development of a noninvasive method to assess cardiac function and other parameters of the cardiovascular system. For individual titles, see N70-10001 through N70-10025.

**N70-10002\*** Minnesota Univ., Minneapolis.

**APPLICATIONS OF THE MINNESOTA IMPEDANCE CARDIOGRAPH**

William G. Kubicek In its Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and other Cardiac Parameters 30 Jun. 1969 p 1-15 (See N70-10001 01-04)

Avail: CFSTI CSCL 06B

A four-electrode configuration for measuring cardiac output or other cardiovascular or pulmonary functions is described, and some applications of the instrument are suggested. The method for calculating stroke volume and cardiac output is treated in detail. Mention is made of the use of the impedance cardiograph as a visual monitor of the heart's mechanical action and in studies of circulation in the legs.

A.C.R.

**N70-10003\*** Cape Town Univ. (South Africa). Surgical Research Labs.

**THE USE OF THE MINNESOTA IMPEDANCE CARDIOGRAPH IN THE CHRONIC MONITORING OF CARDIAC TRANSPLANT PATIENTS AT THE GROOTE**

### SCHUUR HOSPITAL, CAPE TOWN

David A. Boonzaier and C. N. Barnard In Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and other Cardiac Parameters 30 Jun. 1969 p 16-42 (See N70-10001 01-04)

Avail: CFSTI CSCL 06B

The utilization of the impedance cardiograph in chronic monitoring of two cardiac transplant patients is described. The instrument was evaluated for its reliability as a noninvasive method of assessing output and other cardiac parameters, not only for use in clinical medicine but also for possible aerospace medicine applications. Over an eleven month period, the cardiograph was used in chronic monitoring, with a close watch simultaneously kept on clinical, biochemical, serological, ECG and ZCG parameters. The objective was to establish baselines for cardiac transplants and to give early warning of rejection should it ensue. Acute rejection was suspected and treated on several occasions, but since none progressed to complete rejection the diagnosis was never conclusively confirmed. On the basis of the obtained results, however, it was concluded that the instrument, together with ECG and other tests, is a valuable adjunct to diagnosis and an index of the efficiency of treatment and return of the transplant patient to normality.

A.C.R.

**N70-10004\*** Cornell Univ., New York. Dept. of Surgery

**THE USE OF THE IMPEDANCE CARDIOGRAPH IN ASSESSING THE HUMAN CARDIAC TRANSPLANT**

Robert L. Kaster, C. Walton Lillehei, and Peter J. Starek In Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters 30 Jun. 1969 p 43-66 refs (See N70-10001 01-04)

Avail: CFSTI CSCL 06E

Experience with impedance cardiography in detecting subclinical cardiac rejection is reviewed, and the monitoring technique is described in detail. Two cardiac transplant patients were studied using the cardiograph intermittently over periods of two and three months respectively. Results for each patient are given, and it is reported that four additional cases were selected for further evaluation of the instrument following this initial study, with specific changes in technique being initiated with them. From all of the studies, it is concluded that reliable and reproducible records can be obtained provided a thorough understanding of the instrument and a certain operative efficiency is achieved. In addition, it is felt that impedance cardiography may lead to understanding of other intracorporeal disturbances through improved techniques of data analysis.

A.C.R.

**N70-10005\*** Colorado Univ., Denver. Depts. of Surgery.

**TRANSTHORACIC ELECTRICAL IMPEDANCE AS A CLINICAL GUIDE TO INTRATHORACIC FLUID VOLUMES**

Marvin Pomerantz and Ben Eiseman /*In Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and other Cardiac Parameters* 30 Jun. 1969 p 67-77 refs (See N70-10001 01-04)  
(Grant N00014-69-A0078-0001)  
Avail: CFSTI CSCL 06B

Preliminary clinical data concerning change in transthoracic impedance, as it reflects intrathoracic fluid accumulation, are presented, and the experimental technique is described in detail. Implicit in the system is the use of impedance cardiography as a guide to the early detection of pulmonary edema and insufficiency. Twelve patients with a variety of clinical conditions, either producing or suspected of producing increased intrathoracic fluid volumes, were studied. The data indicate the impedance ( $Z_0$ ) changes are an accurate reflection of changes in such volumes. A.C.R.

**N70-10006\*#** Walter Reed Army Medical Center, Washington, D.C. Div. of Surgery.

**ALTERATIONS IN TRANSTHORACIC ELECTRICAL IMPEDANCE WITH ACUTE INTRAVASCULAR OVERLOAD**

Irwin J. Berman, Walter L. Scheetz, Edward B. Jenkins, and Howard V. Hufnagel /*In Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters* 30 Jun. 1969 p 78-96 refs (See N70-10001 01-04)

Avail: CFSTI CSCL 06E

An experiment with dogs is reported which was designed to determine changes in transthoracic electrical impedance that accompany intravenous overinfusion and pulmonary edema and to relate these changes to certain hemodynamic factors in control animals and in experimental models of hemorrhagic and septic shock. Emphasis was placed upon establishing the relationship between transthoracic impedance and conventional measurements which are used in the care of critically ill patients. Fall in the transthoracic impedance is accompanied by elevated cardiac output, fall in peripheral resistance, and peripheral and pulmonary arteriovenous shunting. Impedance changes may occur as the result of increased conductivity due to decreased intrapulmonary aeration or to increased intrathoracic fluid volume. Differentiation between intravascular and extravascular volume was not possible. Author

**N70-10007\*#** Harvard Univ., Boston, Mass. Dept. of Surgery.  
**PULMONARY EXTRAVASCULAR WATER VOLUME: POTENTIAL FOR MEASUREMENT BY THE MINNESOTA IMPEDANCE CARDIOGRAPH**

Joseph M. Van de Water, Jaen-Min Sheh, Nicholas E. O'Connor, and Francis D. Moore /*In Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and other Cardiac Parameters* 30 Jun. 1969 p 97-102 refs (See N70-10001)

Avail: CFSTI CSCL 06B

Initial studies on the detection and quantification of early pulmonary edema are briefly reported. The pulmonary extravascular water volume is measured in critically ill and cardiac surgery patients. When normalized in terms of the patients's total lung capacity, the water volume was found to correlate well with the clinical course, X-ray changes, and the pulmonary shunt. Author

**N70-10008\*#** Albert Einstein Coll. of Medicine, New York.  
**CLINICAL AND EXPERIMENTAL USE OF THORACIC IMPEDANCE PLETHYSMOGRAPHY IN QUANTIFYING MYOCARDIAL CONTRACTILITY**

John H. Siegel, Miklos Fabian, Charles Lankau, Michael Levine,

Andrew Cole et al /*In Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters* 30 Jun. 1969 p 103-141 refs (See N70-10001 01-04)

(Grants HE-10033; HE-10415)

Avail: CFSTI CSCL 06E

Measurements on high risk patients and on anesthetized dogs to determine cardiac output by thoracic impedance plethysmography are described. Aortic and intraventricular pressures, the first derivative of the intraventricular pressure pulse, changes in impedance, and the first derivative of the impedance curve were obtained. Myocardial isometric time-tension relations and myocardial force-velocity relations were established and are discussed, and data are graphed. It is felt that thoracic impedance pulse evaluation permits determination of the basic myocardial contractile state and the response of cardiac inotropic agents. N.E.N.

**N70-10009\*#** Iowa Univ., Iowa City. Dept. of Pediatrics.  
**THE FIRST DERIVATIVE THORACIC IMPEDANCE CARDIOGRAM: A USEFUL SIGNAL FOR TIMING EVENTS IN THE CARDIAC CYCLE**

Zudhi Lababidi, D. A. Ehmke, Robert E. Durnin, Paul E. Leaverton, and Ronald M. Lauer /*In Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters* 30 Jun. 1969 p 142-161 refs (See N70-10001 01-04)

Avail: CFSTI CSCL 06E

When an alternating current of high frequency is applied to the thorax, the first derivative of the impedance to this current is affected by the volumetric changes occurring during the cardiac cycle. Phonocardiograms, ECG's and first derivative impedance cardiograms (ICG) were recorded simultaneously in 91 subjects. The ICG's were found to have sharply demarcated points which occur synchronously with the first heart sound, aortic second sound, pulmonic second sound, mitral opening snap, third heart sound and fourth heart sound. The ICG may thus be used not only as a reference tracing to help identify heart sounds on the phonocardiogram, but also to directly time intervals within the cardiac cycle. Clinically it proved to be useful in measuring the split of the second heart sound, recognizing the third and fourth systolic valves, mitral opening snaps, systolic ejection clicks on the phonocardiogram, and identifying P waves in ECG's showing arrhythmia. Author

**N70-10010\*#** Minnesota Univ., Minneapolis. Medical School.  
**PHYSIOLOGICAL CORRELATES OF THE CARDIAC THORACIC IMPEDANCE WAVEFORM**

James N. Karnegis and William G. Kubicek /*In its Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters* 30 Jun. 1969 p 162-174 refs (See N70-10001 01-04)

Avail: CFSTI CSCL 06E

Experimental results are described to correlate the impedance waveform deflections with physiological events. Four circular, flexible, metallic electrodes were used, two around the neck and two around the upper abdomen of the patient. An activating 6 ma, 100 kc sinusoidal current was passed through the outer two electrodes from a constant current source, and pulsatile changes in the thoracic impedance, related to the beating of the heart, were recorded. An increase in impedance is associated with atrial contraction and consistently follows the P wave of the electrocardiogram. Two other waves show a decrease in impedance. The first is associated with ventricular systole and corresponds in time with the QRS complex of the electrocardiogram. The systolic wave is then followed by the third component, which also shows

a decrease in impedance but occurs in diastole. In instances of arrhythmias the deflection associated with the P wave occurs independently of the other two deflections. The impedance change waveform is similar to the pattern of blood flow in the venae cavae and the pulmonary veins. Author

**N70-10011\*# Utah Univ., Salt Lake City. Dept. of Biophysics.  
COMPARISON OF METHODS FOR CALCULATING STROKE  
VOLUME FROM AORTIC PRESSURE AND IMPEDANCE  
CARDIOGRAPH**

W. Sanford Topham and Homer R. Warner /In Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters 30 Jun. 1969 p. 175-185 refs (See N70-10001 01-04)  
Avail: CFSTI CSCL06E

The accuracy and feasibility of using the impedance cardiograph to calculate central blood flow using noninvasive methods was studied first on dogs, and then on human subjects. Beat by beat comparison was made between stroke volume calculated by computer from pressure pulse, and stroke volume was calculated by the impedance cardiograph. With the normal human subject, an 18 gauge needle was inserted into the radial artery. Through this needle a catheter was inserted to the aortic arch. In a supine position, he exercised for two to three minutes using an exercycle. The control and after exercise waveforms of the EKG, PP, and  $dz/dt$  are presented. It is concluded that: the correlations from the dog are better than those for humans, and it is impractical to make beat by beat calculations for monitoring humans by this method. F.O.S.

**N70-10012\*# Minnesota Univ., Minneapolis. Dept. of Physical  
Medicine.**

**THE DEVELOPMENT OF A TRANSFER FUNCTION  
BETWEEN AORTIC BLOOD FLOW AND THE FIRST  
DERIVATIVE OF THE THORACIC IMPEDANCE**

Robert P. Patterson, David A. Witsoe, A. H. L. Fromm, and William S. Kubicek /In its Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters 30 Jun. 1969 p. 186-202 refs (See N70-10001 01-04)  
Avail: CFSTI CSCL06E

The technique for calculating stroke volume from thoracic impedance measurement used for finding the transfer function between the aortic blood flow and the first derivative of the thoracic impedance signal is described. The transfer function was developed by taking the Fourier series for both the impedance derivative signal with the diastolic portion set equal to zero, and the aorta flow signal. It is concluded that the transformed impedance signal improves the reliability of the thoracic impedance signal in determining change in stroke volume. F.O.S.

**N70-10013\*# Duke Univ., Durham, N.C. Dept. of Medicine.  
EVALUATION OF THORACIC IMPEDANCE  
PLETHYSMOGRAPHY AS AN INDICATOR OF STROKE  
VOLUME IN MAN**

Robert J. Bache, Alexander Harley, and Joseph C. Greenfield /In Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters 30 Jun. 1969 p. 203-235 refs Sponsored in part by N.C. Heart Assoc. (See N70-10001 01-04)  
(Grant HE-09711)

Avail: CFSTI CSCL06E

The maximum negative first derivative of the systolic thoracic impedance change, and duration of ejection were measured in 8 patients with cardiomegaly, while stroke volume was computed continuously using the pressure gradient technique. Wide variations in heart rate and stroke volume were produced by atrial pacing, as pulsus alternans occurred spontaneously. Duration of ejection showed a close curvilinear relationship with stroke volume expressed as a logarithmic function which was similar for all patients. A linear relationship existed between the maximum impedance derivative and stroke volume which was close in some patients but was poor or varied with heart rate in others. No independent characteristic was found to predict in which patients the maximum impedance derivative reliably reflected changes in stroke volume. Wide variations in this relationship between individuals prevented its satisfactory description for all patients by any single equation. Author

**N70-10014\*# Florida Univ., Gainesville. Div. of Cardiology.  
STUDIES USING THE IMPEDANCE CARDIOGRAPH AS A  
POTENTIAL MONITOR DURING TREATMENT OF ACUTE  
DISSECTING ANEURYSMS**

R. S. Elliot, Howard W. Ramsey, R. F. Palmer, and E. K. Prokop /In Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters 30 Jun. 1969 p. 236-246 refs (See N70-10001 01-04)  
Avail: CFSTI CSCL06E

The purpose of this study was to attempt to correlate the impedance output,  $dz/dt$ , with the cardiac parameters  $dP/dt$  sub max and contractility.  $dP/dt$  sub max (in the ascending aorta) and the impedance output,  $dZ/dt$  were recorded output,  $dZ/dt$  were recorded before and after Isuprel administration in humans. The mean ratio  $dP/dt$  sub max  $dP/dt$  sub max after and before Isuprel administration was 2.0. The mean ratio for  $dZ/dt$  under the same conditions was 1.7. The impedance cardiograph was then used on dogs along with a catheter positioned in the ascending aorta, and a strain gauge the left ventricle. Isoproterenol (4 micrograms), Arfonad Arfonad (2 mg), and propranolol (1.5 mg/kg.) were given IV with an appropriate time interval drug. The  $dP/dt$  sub max correlated with the height of the max correlated with the height of the strain gauge recording. The impedance output, either  $dP/dt$  sub max or the height of  $dP/dt$  sub max or the height of the strain gauge recording. Author

**N70-10015\*# Orange County Medical Center, Calif.  
A COMPARISON OF CARDIAC OUTPUT VALUES BY THE  
IMPEDANCE CARDIOGRAPH AND DYE DILUTION  
TECHNIQUES IN CARDIAC PATIENTS**

Loren W. Heather /In Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters 30 Jun. 1969 p. 247-258 (See N70-10001 01-04)  
Avail: CFSTI CSCL06E

Data obtained by use of the impedance cardiograph with simultaneous data obtained at cardiac catheterization and angiocardiology are correlated. The conclusions reached after studying 38 patients are: (1) Aortic insufficiency results in increased impedance output, in proportion to the severity of the insufficiency. (2) Mitral insufficiency, in moderate or severe degree, gives a falsely low impedance output by the impedance technique. (3) In other individuals impedance output seems to be relatively similar to dye dilution output. (4) An index is proposed for evaluation of left ventricular function. F.O.S.

**N70-10016\*#** Marquette Univ., Milwaukee, Wis.  
**ESTIMATE OF CARDIAC OUTPUT WITH THE IMPEDANCE  
 CARDIOGRAPH DURING POSTURAL STRESS**

James J. Smith, John E. Bush, V. Thomas Wiedmeier, and Felix E. Tristani / *In* Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters 30 Jun. 1969 p 259-266 refs (See N70-10001 01-04)

Avail: CFSTI CSCL06E

A number of cardiac output determinations by densitometer measurements and stroke volume estimation during head-up tilt of humans were analyzed: (1) to assess the validity of the transthoracic impedance method for the measurement of cardiac output; and (2) to determine its possible usefulness in studying circulatory response to postural and other tests. In 35 simultaneous determinations a correlation coefficient of +0.87 was found between the two methods; impedance readings averaged about 10% higher than densitometer dye readings. Impedance records were also analyzed for auxiliary hemodynamic values, such as  $dZ/dt$ , the (R-Z) interval, and left ventricular ejection time. It was concluded that impedance cardiography may have considerable potential for application in cardiology. G.G.

**N70-10017\*#** Air Force Academy, Colo. Bioengineering Lab.  
**A COMPARISON OF CHANGES IN STROKE VOLUME AND  
 CARDIAC OUTPUT IN SUBJECTS STRESSED BY UPRIGHT  
 TILT AND LOWER BODY NEGATIVE PRESSURE**

Richard J. Gowen, Richard D. Barnett, and Fred L. Zaebs / *In* Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters 30 Jun. 1969 p 267-295 refs (See N70-10001 01-04)

Avail: CFSTI CSCL06E

The impedance cardiograph was used to measure stroke volume, heart rate and cardiac output changes in six normal subjects during tests designed to compare the cardiovascular effects of -20, -30, -40 and -50 mm Hg lower body negative pressure with those produced by 70° upright tilt. Repeatable stroke volume results were obtained from all subjects during recumbent rest and stress. For the three parameters measured, tilt was found to represent a greater stress than -20, -30 or -40 mm Hg pressure, -50 mm Hg or a combined -40, -50 mm Hg profile was found to represent a greater stress than tilt. It was concluded, therefore, that the equivalency point for negative pressure versus tilt lies somewhere between -40 and -50 mm Hg pressure. When a tilt stress was preceded during the same experiment by a negative pressure stress, the responses were greater than those obtained when tilt was the initial stress. Author

**N70-10018\*#** Baylor Univ., Houston, Tex. Dept. of Physiology.  
**COMPARATIVE EVALUATION OF THE THORACIC  
 IMPEDANCE AND ISOTOPE DILUTION METHODS FOR  
 MEASURING CARDIAC OUTPUT**

W. V. Judy, F. M. Langley, K. D. Mc Cowen, D. M. Stinnett, L. E. Baker et al / *In* Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters 30 Jun. 1969 p 296-300 refs (See N70-10001 01-04)

(Grant HE-5125)

Avail: CFSTI CSCL06E

Values of cardiac output determined simultaneously in 17 normal adult male human subjects by means of thoracic impedance changes and radioisotope dilution are compared. The absolute values of cardiac output determined by the impedance technique were 1.31 times higher than those measured by radioisotope with

the subjects at rest and after moderate exercise. Even though the absolute values as found by the two methods were not the same, the changes in magnitude were comparable. Author

**N70-10019\*#** Baylor Univ., Houston, Tex.  
**COMPARATIVE EVALUATION OF THE THORACIC  
 IMPEDANCE AND ELECTROMAGNETIC FLOW PROBE  
 METHOD FOR MEASURING CARDIAC OUTPUT**

William V. Judy, Frank M. Langley, Karl D. Mc Cowen, and Lee E. Baker / *In* Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters 30 Jun. 1969 p 301-313 refs (See N70-10001 01-04)

Avail: CFSTI CSCL06E

It has been found that the transthoracic electrical impedance method's ability to estimate cardiac output compares very well with that of the electromagnetic flowmeter in dogs. A correction value of 1.05 was found between the two techniques as compared to 1.18, 1.29, and 1.31 previously found in dilution method comparisons. The absolute values determined in this study correlated well ( $r = 0.92$ ) and a mean difference of 5 percent was found. It is felt that the characteristics of the ease of application, lack of invasive procedures or implants inherent to the ACG method along with the knowledge gain in this study is sufficient to warrant continued use of this method. Author

**N70-10020\*#** Public Health Service Hospital, Baltimore, Md. Clinical Investigations Service.

**EVALUATION OF ELECTRICAL IMPEDANCE  
 CARDIOGRAPHIC MEASUREMENTS OF HEART FUNCTION  
 IN COMPARISON TO INDICATOR DILUTION AND  
 PRESSURE GRADIENT METHODS**

Ray T. Steigbigel, Henry Babbit, and J. Richard Warbasse / *In* Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters 30 Jun. 1969 p 314-329 refs (See N70-10001 01-04)

Avail: CFSTI CSCL06E

Cardiac output, stroke volume, and peak ascending aortic blood velocity estimates obtained from impedance, indicator flow, and pressure gradient measurements were compared and evaluated. Measurements were made during ventricular premature contractions, the Valsalva maneuver, normally conducted beats, isoproterenol infusion, and during rest and recovery periods. Preliminary correlation data suggest that the impedance cardiogram is useful in instantaneous evaluation of mechanical heart functions. G.G.

**N70-10021\*#** Minnesota Univ., Minneapolis. Dept. of Physical Medicine and Rehabilitation.

**EVALUATION OF IMPEDANCE CARDIOGRAPHIC  
 TECHNIQUES FOR MEASURING RELATIVE CHANGES IN  
 CARDIAC OUTPUT BY SIMULTANEOUS COMPARISON  
 WITH INDICATOR DILUTION AND ELECTROMAGNETIC  
 FLOWMETER**

David A. Witsoe, Robert P. Patterson, A. H. L. From, and W. G. Kubicek / *In its* Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters 30 Jun. 1969 p 330-355 (See N70-10001 01-04)

Avail: CFSTI CSCL06E



Results are presented of an evaluation of impedance techniques for monitoring relative changes in cardiac output. The cardiovascular system of the anesthetized dog was stressed, and cardiac output was monitored using three techniques: the indicator dilution method, electromagnetic flowmeter, and impedance cardiography. To achieve the desired results, several drugs were used to vary four cardiovascular function parameters: heart contractility, peripheral resistance, pulse rate, and stroke volume. The experiments involved cardiovascular stress over a wide dynamic range to 14 dogs; in some cases the stress was nearly to the point of destruction. The ability of the impedance system to predict relative changes in cardiac output was not as satisfactory as that achieved with dye dilution and flowmeter methods. There were sufficient conditions, however, under which the method did accurately predict the changes to warrant further efforts and research. A.C.R.

**N70-10022\*#** Washington Univ., Seattle. Dept. of Anesthesiology.  
**IMPEDANCE STROKE VOLUME: A COMPARISON IN DOGS AND MAN WITH ELECTROMAGNETIC FLOWMETERS AND DYE DILUTION RESPECTIVELY**

Wayne E. Martin /In Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters 30 Jun. 1969 p 357-384 (See N70-10001 01-04)  
 Avail: CFSTI CSCL 06E

Observations of stroke volumes in dogs were extended over a wide variety of cardiovascular states, including altered contractility, peripheral vasoconstriction and vasodilation, and hypovolemia. In addition, measurements were obtained using human subjects whose cardiovascular systems were depressed. The data indicate that the impedance cardiogram, in its present configuration, is not a suitable clinical tool, because the possibility exists that the data obtained at a critical instant might show good cardiac function when the system is actually in a state of collapse or vice versa. The overall correlation between conventional and impedance stroke volume, however, indicates that the method may be useful in special circumstances. In particular, it could be utilized in space medicine if proper weight is given to the above limitations. A.C.R.

**N70-10023\*#** Rochester Univ., N.Y. Coll. of Engineering and Applied Science.

**CARDIAC OUTPUT FROM TRANSTHORACIC IMPEDANCE VARIATIONS, REVIEW OF EXPERIENCE WITH HEART PATIENTS**

E. Kinnen /In Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters 30 Jun. 1969 p 385-403 refs Sponsored by USAF/ONR/NSF (See N70-10001 01-04)  
 Avail: CFSTI CSCL 06E

Results of a study of the changes in electrical impedance fluctuations measured across the thorax are reported in an attempt to ascertain whether these changes can be used as the basis of an indirect measure of cardiac output (CO) or stroke volume. Specifically, efforts in interpreting impedance waveforms and their effects on the accurate prediction of CO in man are reviewed. A brief description of the plethysmograph for recording the impedance variations and the procedure used to obtain the data is also given. A.C.R.

**N70-10024\*#** Miami Univ., Fla. Dept. of Neurology.  
**RESISTIVE AND REACTIVE (CAPACITIVE) CARDIAC IMPEDANCE PULSES**

Richard Namon and Frank Gollan /In Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters 30 Jun. 1969 p 404-421 refs (See N70-10001 01-04)  
 (Grants NB05654-01; HE-09866)  
 Avail: CFSTI CSCL 06E

An indirect method to measure cardiac stroke volume, using electrical impedance methods with electrodes on the body surface of anesthetized greyhound dogs, was developed. The amplitude of resistive and reactive impedance pulses was compared with the stroke volume calculated from cardiac output determinations using the green dye dilution technique. Reactive impedance pulses reflected the stroke volume changes more accurately and were therefore used for the study. In 14 dogs, reactive impedance changes were compared with 129 dye dilution determinations over a wide range of stroke volumes produced by hemorrhage, transfusion, hypothermia, and drugs. The correlation coefficient between the two methods was 0.91. The standard deviation from a best-fit line on a log-log plot amounted to 19% and 0.53 milliohm corresponded to 1 milliliter of stroke volume. Author

**N70-10025\*#** Scott and White Clinic, Temple, Tex.

**THE POTENTIAL ROLE OF IMPEDANCE PLETHYSMOGRAPHY IN AEROSPACE MEDICINE**

Robert D. Allison /In Minn. Univ. Develop. and Evaluation of an Impedance Cardiographic System to Meas. Cardiac Output and Other Cardiac Parameters 30 Jun. 1969 p 422-468 refs (See N70-10001 01-04)

Avail: CFSTI CSCL 06E

The suitability of biological impedance measuring techniques for studies in earth-based laboratories and for evaluating biological parameters in the dynamic environment related to human activity on earth and in space is discussed. The applications of four-electrode impedance plethysmography are treated in the following areas: (1) cardio-pulmonary dynamics of ventilation, stroke volume, and cardiac output; (2) blood volume distributions during weightlessness and changes in body posture; (3) measurements of peripheral pulse volume and blood flow, with particular reference to environmental factors influencing these measurements; (4) effects of age and blood pressure changes on recorded peripheral blood pulse volumes; and (5) measurements of kidney-area blood pulse volume; in addition, the concept of silhouette studies using impedance plethysmography in the unconditioned healthy subject and the subject exposed to environmental and pathological stress is also taken into account. Author

**N70-10037+** National Lending Library for Science and Technology, Boston Spa (England).

**A COMMON STRUCTURE FOR THE ACTIVITY OF OPERATORS AND SOME CONDITIONS FOR ITS FORMATION [OBSHCHAYA STRUKTURA DEYATEL'NOSTI OPERATOROV I NEKOTORYYE USLOVIYA EE FORMIROVANIYA]**

E. A. Mileryan et al Jul. 1969 30 p refs Transl. into ENGLISH from Vopr. Psikhologii (Moscow), no. 4, 1966 p 74-86 (NLL-RTS-5180) Avail: Natl. Lending Library, Boston Spa, Engl.: 30s

Psychological studies of an operator's duties are reviewed to emphasize that the primary component in the activity structure of such workers is tracking the course of events and closely watching the general behavior and condition of the systems under their control. Based on these data, an experimental installation consisting of two control desks for the subject and the experimenter was devised to study the peculiar psychological implications in the formation of such operators' skills as have a common significance

and are essential in work at a remote control desk. The number of repetitions required for acquisition of reflexes and capacities show considerable individual differences in the ability of subjects to master the work of an operator. A psychological selection program is recommended for choosing secondary school matriculants as candidates for professional training. M.G.J.

**N70-10044\*#** Northrop Corp., Van Nuys, Calif. Electronics Div.  
**BIOMEDICAL RECORDING SYSTEMS Final Report**  
Aug. 1969 31 p  
(Contract NAS9-7856)

(NASA-CR-101978; NORT-68-480) Avail: CFSTI CSCL 06B

The hardware definition, development, fabrication, and test of the recording system are described. The system is designed for use during portions of preflight and postflight medical examinations of flight crew personnel on Apollo missions. To give the system flexibility, it is packaged in three suitcases that also serve as shipping containers when closed. The system consists of signal conditioners, visual indicators, magnetic and strip-chart recorders, and auxiliary system parts. Author

**N70-10046\*#** Texas Inst. for Rehabilitation and Research, Houston.  
**EVALUATION OF PHONOCARDIOGRAPHIC DATA OF ASTRONAUTS DURING ORBITAL FLIGHTS**

Carlos Vallbona (Baylor Univ., Houston, Tex.), Lawrence F. Dietlein (NASA. Manned Spacecraft Center, Houston, Tex.), and William V. Judy (NASA. Manned Spacecraft Center, Houston, Tex.) [1969] 35 p refs

(Contract NAS9-6162)

(NASA-CR-101981) Avail: CFSTI CSCL 06S

Simultaneous electrocardiographic and phonocardiographic records were obtained from both crew members during the flights of Gemini 4 and 5 and on the pilot of Gemini 7. Analysis of the data recorded during flight reveals: wide fluctuations of the duration of the cardiac cycle within physiological limits throughout the mission; fluctuations in the duration of the electromechanical systole that correlated with the changes in heart rate; stable values of the electromechanical delay; considerable shortening of the duration of the cardiac cycle (i.e. increase in heart rate), of the electromechanical systole and, to a lesser extent, of the electromechanical delay at lift-off, at reentry and for the few hours that preceded reentry. It is likely that the shortening of the cardiac cycle and of its phases occurred in response to positive chronotropic and inotropic influences (adrenergic reaction) that were observed in all the astronauts who participated in this experiment. Author

**N70-10100\*#** Techtran Corp., Glen Burnie, Md.  
**BIOLOGICAL EFFECT OF LOW MAGNETIC FIELD ENVIRONMENTS [ACTION BIOLOGIQUE DES AMBIANCES A FAIBLE CHAMP MAGNETIQUE]**

L. Miro Washington NASA Nov. 1969 6 p refs Transl. into ENGLISH from the French

(Contract NASw-1695)

(NASA-TT-F-12691) Avail: CFSTI CSCL 06F

Irridiation by cosmic rays in the absence of the protective geomagnetic field, and the direct action of the low magnetic field could cause adverse effects. Tests are cited (physiological, visual, and psychological) which indicate no differences between experimental and control subjects, whether animal, plant, or human. Only the critical threshold of fusion was significantly disturbed. In prolonged

experiments on mice, however, after four months alopecia due to generalized hyperplasia was observed, with premature death of the animals in four months to one year. Consideration of these results leads to the conclusion that additional long term experiments are needed. Author

**N70-10123#** Joint Publications Research Service, Washington, D.C.

**ALL-UNION SYMPOSIUM ON SYSTEMS RESEARCH**

M. D. Akhundov et al 27 Oct. 1969 6 p Transl. into ENGLISH from Vopr. Filosofii (Moscow), no. 8, 1969 p 158-161 Held at Moscow, Jan. 1969

(JPRS-49130) Avail: CFSTI

Summaries of papers on the methodology of systems research are given. The significance of the general ideas of cybernetics, the problem of optimization of systems, and the rational description of systems was emphasized. A critical assessment of the speaker's conclusion accompanies brief discussions on programmed control of the national economy, the general games concept in systems research, the application of the heuristic approach, Markov random processes, the planning of systems, and the dynamic theory of systems. M.H.E.

**N70-10124** National Lending Library for Science and Technology, Boston Spa (England).

**INFORMATION CODING IN THE PERIPHERAL PART OF THE AUDITORY SYSTEM [O KODIROVANII INFORMATSII V PERIFERICHESKOM OTDELE SLUKHOVOY SISTEMY]**

I. A. Lyubinskiy Jul. 1969 23 p refs Transl. into ENGLISH from Teor. i Sredstva Avtomatiki (USSR), 1968

(NLL-RTS-5240) Avail: Natl. Lending Library, Boston Spa, Engl.: 25s

Improvement in sharpening for the conversion of information provided by a sound signal was investigated in the receptor cells and in the neurons of the spiral ganglion. Vibratory processes in the basilar membrane and the neuronal elements of the cochlea were examined. Increasing the tuning sharpness of neurons in the spiral ganglion by summing the responses of many hair cells within the spiral fiber was selected as a possible mechanism; this hypothesis did not introduce lateral connections between neurons of the spiral ganglion. The conclusions indicate that: (1) although the basilar membrane has a low figure of merit, this property apparently increases the response speed of the auditory system; (2) neurons at the first stage of the auditory system have higher selectivity than the basilar membrane; (3) the velocity of wave propagation travelling in the membrane is a constant; at the place of maximum amplitude of membrane vibration, (4) a model of neural improvement in sharpening using the disperse properties of the membrane and the ability of a spiral fiber to summate responses of many receptor cells is feasible. M.H.E.

**N70-10136#** Federation of American Societies for Experimental Biology, Bethesda, Md.

**EFFECT OF OXYGEN TENSION IN THE SURROUNDING MEDIUM ON CORTICAL ELECTRICAL ACTIVITY DURING HYPOTHERMIA**

Yu. S. Alyukhin 1969 18 p refs Transl. into ENGLISH from Fiziol. Zhurnal SSSR (Moscow) v. 54, no. 9, 1968 p 998-1012 (PB-184206T; NS-148) Avail: CFSTI CSCL 06P

A decrease in pressure of the inspired air to 360 and 220 mm Hg causes a relative decrease in the integral area (at brain temperatures of 30-22C) and frequency (at brain temperatures of

32-18C) of cortical potentials of rats during hypothermia. During progressive cooling of rats the temperature at which cortical electrical activity ceases is almost or completely independent of the oxygen tension in the surrounding medium. Hypoxia probably does not play an important role in the hypothermic depression of cortical electrical activity in rats. Author (USGRDR)

**N70-10137#** Federation of American Societies for Experimental Biology, Bethesda, Md.

**SHAPE OF THE ELECTRIC FIELD CREATED BY A BIPOLAR NEURON**

N. F. Podvigin 1969 17 p refs Transl. into ENGLISH from Biofizika (USSR) v. 13, no. 2, 1968 p 282-289 (PB-184200T; NS-123) Avail: CFSTI CSCL 06P

The paper gives details of the configuration of the electric field generated by a multidendritic neuron, a bipolar cell of the retina. The field potential was determined by means of an analog model, an electrolytic bath, from its internal layers. Author (USGRDR)

**N70-10138#** National Library of Medicine, Bethesda, Md.

**AN ANNOTATED BIBLIOGRAPHY OF BIOMEDICAL COMPUTER APPLICATIONS**

Ruth Allen, comp. Jun. 1969 221 p

(Contract PH-43-67-1152)

(PB-184225) Avail: CFSTI CSCL 06E

The document is an annotated bibliography of publications on the application of computer science to biomedicine. It presents bibliographies, books and monographs, and selected articles representative of the many aspects of biomedical computing. The aim of the bibliography is to make articles of particular interest to the reader more accessible by pointing out the various method and techniques and their applications in the various biomedical fields, and by indicating what material is discussed in each article. USGRDR

**N70-10169\*#** Dynamic Science Corp., Monrovia, Calif.

**MICROBIAL CELL RECOVERY FROM SOLID MATERIALS Final Summary Report**

14 May 1968 282 p refs Prepared for JPL

(Contracts NAS7-100; JPL-950740)

(NASA-CR-106488) Avail: CFSTI CSCL 06M

**CONTENTS:**

1. MICROBIAL CELL RECOVERY FROM SOLID MATERIALS, VOLUME 1 p 3-52 refs (See N70-10170 01-04)
2. MICROORGANISMS IN SOLID MATERIALS, VOLUME 2, PHASES 1-4 p 53-186 refs (See N70-10171 01-04)
3. MICROORGANISMS IN SOLID MATERIALS, VOLUME 3, TASK 1: RESISTANCE OF ALPHA ORGANISMS TO DRYING AND TO STERILIZATION BY ETHYLENE OXIDE p 187-223 refs (See N70-10172 01-04)
4. MICROORGANISMS IN SOLID MATERIALS, VOLUME 4, TASK 2: NATURALLY OCCURRING MICROBIOLOGICAL FLORA FROM NORMALLY PREPARED PROPELLANT SPECIMENS p 224-255 refs (See N70-10173 01-04)
5. MICROORGANISMS IN SOLID MATERIALS, VOLUME 5, TASK 3: RECOVERY LEVELS OF MICROBIAL ORGANISMS INOCULATED INTO SOLID PROPELLANT SPECIMENS p 256-286 (See N70-10174 01-04)

**N70-10170\*#** Dynamic Science Corp., Monrovia, Calif.

**MICROBIAL CELL RECOVERY FROM SOLID MATERIALS, VOLUME 1**

In its Microbial Cell Recovery from Solid Mater. 14 May 1968 p 3-52 refs Prepared for JPL (See N70-10169 01-04)

Avail: CFSTI CSCL 06M

Methods of preparing spacecraft solid materials for microbial recovery and techniques of culturing microorganisms are discussed. Pulverization by hacksaws is investigated, and fine tooth blades made of nickel molybdenum alloy or tungsten steel are recommended. Polyester and epoxy resins were pulverized satisfactorily and solid rocket propellant was the most difficult component material. Fluids for leaching pulverized materials and for neutralizing toxic materials are described, and the most effective for several plastics are indicated. Procedures for culturing microorganisms are outlined, and include chamber assembly, surface decontamination, ethylene oxide analysis and replacement with air, as well as the pulverizing and leaching methods. N.E.N.

**N70-10171\*#** Dynamic Science Corp., Monrovia, Calif.

**MICROORGANISMS IN SOLID MATERIALS, VOLUME 2, PHASES 1-4**

In its Microbial Cell Recovery from Solid Mater. 14 May 1969 p 53-186 refs Prepared for JPL (See N70-10169 01-04)

Avail: CFSTI CSCL 06M

Research on the detection and recovery of microorganisms in solid spacecraft materials is reported. Culturing was found to be the most reliable method of detecting viability, but electron spin resonance, fluorescent and nonfluorescent staining, electrophoresis and autoradiography were investigated as potentially useful methods. Pulverization of the solids prior to culturing was done by drilling, ball mill, blender, and mortar and pestle. Drilling was the most effective, but recoveries of *B. subtilis* var. *niger*, *Clostridium sporogenes*, and *Ulocladium* were considered to be low. The reliability of drilling and culturing techniques was investigated utilizing cultural determinations at 37° and 25°C. The recoveries were highest when the inoculum was distributed uniformly throughout the solid. Factors affecting the recovery are discussed, and improvements in assaying techniques are described. N.E.N.

**N70-10172\*#** Dynamic Science Corp., Monrovia, Calif.

**MICROORGANISMS IN SOLID MATERIALS, VOLUME 3, TASK 1: RESISTANCE OF ALPHA ORGANISMS TO DRYING AND TO STERILIZATION BY ETHYLENE OXIDE**

In its Microbial Cell Recovery from Solid Mater. 14 May 1969 p 187-223 refs Prepared for JPL (See N70-10169 01-04)

Avail: CFSTI CSCL 06M

The results of experiments to determine the ethylene oxide resistance of populations of alpha in a variety of environments and after several types of pretreatment are presented. The evidence for identifying alpha as a strain of *Staphylococcus epidermidis* is given, and its habitat and clonal variation are mentioned. Data on the resistance of alpha populations to several environmental factors are tabulated. The dominant factor in destroying viability of alpha populations was determined to be drying process in the absence of protective agents. The sensitivity of toxic propellant ingredients was found to depend on the state of the organisms when placed in contact with the ingredient. Native contamination in propellant ingredients was observed to be low. N.E.N.

**N70-10173\*#** Dynamic Science Corp., Monrovia, Calif.

**MICROORGANISMS IN SOLID MATERIALS, VOLUME 4, TASK 2: NATURALLY OCCURRING MICROBIOLOGICAL**

**FLORA FROM NORMALLY PREPARED PROPELLANT SPECIMENS**

In its Microbial Cell Recovery from Solid Mater. 14 May 1968  
p 224 - 255 refs Prepared for JPL (See N70-10169 01-04)  
Avail: CFSTI CSCL 06M

The extent and character of microbiological contamination in each of two batches of solid propellant were measured. In a portion of one batch a population as large as  $10^6$  cells/milliliter was found. While no thermophiles nor obligate anaerobes were detected, many species of aerobes and facultative anaerobes were. Several of these species appear to be more resistant to ethylene oxide than are spores of *B. subtilis*, var. *niger*. Author

N70-10174\*# Dynamic Science Corp., Monrovia, Calif.

**MICROORGANISMS IN SOLID MATERIALS, VOLUME 5, TASK 3: RECOVERY LEVELS OF MICROBIAL ORGANISMS INOCULATED INTO SOLID PROPELLANT SPECIMENS**

In its Microbial Cell Recovery from Solid Mater. 14 May 1969  
p 256 - 286 Prepared for JPL (See N70-10169 01-04)  
Avail: CFSTI CSCL 06M

The minimum number of microorganisms that can be inoculated in solid propellants and subsequently detected by cultural techniques was investigated. The organisms were *Bacillus subtilis* var. *niger*, *Clostridium sporogenes*, *Serratia marcescens*, *Ulocladium*, and *Staphylococcus epidermidis*. Pulverizing the propellant by sawing and leaching are described. Organisms were recovered in all cases at 100/cu cm of inoculum and at the 10/cu cm *B. subtilis*, *C. sporogenes*, and *Staph. epidermidis*. Contaminating organisms as well as test organisms were found in the propellants and in the leached supernatant fluid. The results are considered to indicate that the recovery techniques can be refined to obtain an efficiency of less than one microorganism per cubic centimeter. N.E.N.

N70-10177# Technische Hochschule Munchen (West Germany). Fakultät fuer Maschinenwesen und Elektrotechnik.

**ANALYSIS AND PHYSIOLOGICAL EVALUATION OF TECHNICALLY ATTAINABLE FLASH FORMS OF TRAFFIC SIGNALS WITH A POINT LIGHT SOURCE [ANALYSE UND PHYSIOLOGISCHE BEWERTUNG TECHNISCH ERZIELBARER BLINKFORMEN VON VERKEHRSSIGNALEN MIT PUNKTFOERMIGER LICHTQUELLE]**

Kurt W. Uhl (Ph.D. Thesis) 1969 164 p refs In GERMAN  
Avail: CFSTI

The known methods for the physiological evaluation of flashing lights in signal technology were applied to either certain conditions of observation (threshold determination) or to special signals (beacons). A new method for the evaluation of flashing lights is demonstrated which takes into account the environmental conditions and the intensity of the signal light. The threshold coefficient and the flashing coefficients were defined for this purpose. Additional steps and the required instrumentation are described for changing the flash form. Three different technically attainable flash forms are compared: the exact signal, the flash signal, and the multi-filament signal. These signals are optimized for various operational requirements, taking into account the type of apparatus and energy costs. For the specific example of railroad crossings, it is shown that the exact flash is the best signal form.

Transl. by K.W.

N70-10280# Leiden Univ. (Netherlands). Dept. of Radiation Genetics.

**MOLECULAR AND RADIATION GENETICS Final Report**  
Brussels EURATOM 1969 90 p refs

(Contract EURATOM-052-65-1 BIAN)  
(EUR-4249-e) Avail: CFSTI

Research activities of the Laboratories for Physiological Chemistry and Applied Enzymology and Radiobiology were distributed over six subjects: (1) *in vitro* induction of protein synthesis in general, the synthesis of immune antibodies in particular and the effect of radiation thereon; (2) relation between structure and function of the DNA of viruses including bacterial and animal viruses and the modifying effects of radiation upon them; (3) genetics of micro-organisms and the effect of radiation (UV and ionizing radiation) on such functions as viability, cell division and mutation of bacteria; (4) the effect of ionizing radiation on DNA; (5) mechanism of action of enzymes and modification by irradiation; and (6) investigations of mutations that modify the biological activity of enzymes. Research activities of the Department of Radiation Genetics were divided between the following three subjects: (1) mutation studies with *Drosophila*; (2) gene function, genetic recombination and replication of DNA of bacteriophage and the effect of radiation on these processes; (3) studies in regulatory mechanisms of somatic cells *in vitro*. Author

**N70-10345# Bureau of Radiological Health, Rockville, Md. BIOLOGICAL ASPECTS OF LASER RADIATION. A REVIEW OF HAZARDS**

Wellington Moore, Jr. Jan. 1969 18 p refs  
(PB-184003) Avail: CFSTI CSCL 06E

Concern over the hazards of exposure to laser radiation has resulted in the establishment of guidelines for human exposure by several agencies. Owing to the incompleteness of knowledge concerning biological effects, particularly long-term ones, it is not possible to set firm protection standards at this time. Current guides are based upon the minimum dose required to produce a visible lesion. These threshold values may vary depending upon the criteria by which they are measured. For the eye, threshold damage has been determined by such varying means as ophthalmoscopy, light microscopic histology, histochemical study, and electroretinography.

Author (USGRDR)

**N70-10369# Stanford Univ., Calif. Dept. of Electrical Engineering. SELF REPRODUCING AUTOMATA: SOME IMPLICATIONS FOR THEORETICAL BIOLOGY**

Michael A. Arbib Jul. 1969 45 p refs  
(Contract Nonr-225(87); Grant AF-AFOSR-1198-67)  
(AD-692529; AFOSR-69-2053) Avail: CFSTI CSCL 6/4

The basic concepts of models of self-reproducing automata are reviewed that share with living systems the property of repetitive production of ordered heterogeneity. The models are also shown to require separate descriptions of the system and the active portion of the system, as there is a distinction between the genotype (a set of instructions) and the phenotype (their functioning embodiment). Reasons are discussed as to why this condition may be necessary in more complex organisms. An explanation is given of a way in which an array model of an automaton can exhibit some of the embryonic properties of resistance to damage to augment the automaton-theoretic approach that provides no insight into reaction to damage. Characteristics of an automaton are considered for evolution. The model must contain internal programs that are themselves modifiable programs, in contrast to models in which each module contains the whole program of the organism, differentiation represented only by activation of different portions of the program. An understanding is needed of how to apply coding theory to the problem of endurance and multiplication in the presence of noise. It is suggested that apparent disorder in complex living systems may be due to adaptation.

TAB

**N70-10384#** Library of Congress, Washington, D.C. Aerospace Technology Div.

**REPORT ON INTERNATIONAL PROGRESS IN CEREBRAL ELECTROTHERAPY (ELECTROSLEEP) AND ELECTROANESTHESIA**

Arsen Iwanovsky *In its Foreign Sci. Bull.*, vol. 5, no. 10 Oct. 1969 p 15 - 40 refs (See N70-10382 01-34)

Avail: Issuing Activity

Papers presented at the symposium in September 1969 are reviewed. Emphasis in the presentations was placed on basic research and quantitative evaluation of clinical results. New equipment was displayed and is described briefly. N.E.N.

**N70-10518** Technische Hochschule Munchen (West Germany). Fakultät fuer Allgemeine Wissenschaften.

**MOESSBAUER EFFECT ON FERRO-PORPHYRIN SYSTEMS [MOESSBAUEREFFEKT AN FERRO-PORPHYRIN-SYSTEMEN]**

Alfred Trautwein (Ph.D. Thesis) 1969 10 p refs In GERMAN

Avail: CFSTI

Erroneous interpretations or the complete lack of them for the quadrupole splitting Delta E sub Q and the isomeric shifts delta of Fe(2+) porphyrin systems prompted these calculations and experiments. It was found that the mutual Coulomb rejection of the Fe 3d electrons must not be neglected. Temperature dependence magnitude of Delta E sub Q and delta for deoxidized hemoglobins Hb and dipyrindine hemins could be explained only when considering spin-orbit coupling of the low energy terms. Plus/minus sign and order of magnitude of the calculated electric HbO2 agreed with the experiment under the condition that the spin triplets of the valence electrons of free O2 and of Fe in the Hb are combined in one spin singlet ground state in the HbO2. The Delta E sub Q (T) was predicted for the first time for ferro-porphyrin systems with a spin triplet ground state. In the Moessbauer experiments with the anhydrohemoglobin it was possible to determine the low-energy term 3d(6) configuration and to use the resulting electron term energies in susceptibility calculations that were also experimentally verified. During the preparation of the haptoglobin-hemoglobin absorber it was possible for the first time to crystallize a protein-protein complex. Transl. by K.W.

**N70-10523#** Dynatech Corp., Cambridge, Mass.

**AN EXPERIMENTAL INVESTIGATION AND SYSTEM DESIGN FOR HUMIDITY AND CARBON DIOXIDE LEVEL CONTROL USING THERMAL RADIATION**

John S. Maulbetsch Wright-Patterson AFB, Ohio AFML Apr. 1969 114 p refs

(Contract F33615-67-C-1587)

(AD-692169; AMRL-TR-68-174) Avail: CFSTI CSCL 6/11

An experimental investigation was carried out to verify the feasibility of controlling carbon dioxide levels in space cabin atmospheres by freeze-out techniques using thermal radiation as the only mode of heat rejection. A one-tenth scale system was constructed with the primary aim of gaining understanding of the CO2 precipitation mechanism and determining the operating characteristics of a precipitator plate. Both quantitative measurements and visual observation of the frost formation were made. The geometric characteristics of the precipitator channel were found to be not critical. Uniform frost layer formation could be obtained and premature channel plugging was not a problem. Typical precipitator plate effectivenesses of 0.75 - 0.85 were easily obtainable. Simultaneous CO2 sublimation was achievable at a controllable rate. System stability was easily achieved. Solid CO2 carryover in both the precipitating and sublimating streams is a real possibility and preventive measures must be taken in the final design of the system.

Based on these results, a complete test system was designed to handle the water vapor and carbon dioxide loads in a one-man, manned space enclosure. The system, with a total weight of 51.2 lb, is a two-loop configuration where one loop maintains humidity control and the other removes the generated carbon dioxide and returns all of the accompanying water vapor to the cabin. The system will operate indefinitely with no operator intervention, is operable in zero-gravity, and is of low weight, volume, and power.

Author (TAB)

**N70-10601\*#** Aztec School of Languages, Inc., Maynard, Mass. Research Translation Div.

**SIGNIFICANCE OF ANISOTROPY AND HOMOGENEITY FOR THE DETERMINATION OF THE ELASTICITY OF BLOOD VESSELS**

Victor Hardung Washington, D.C. NASA Oct. 1969 17 p refs Transl. into ENGLISH from *Angiologica*, v. 1, no. 2, 1964 p 141 - 155 Sponsored by Swiss Natl. Fund for Sci. Res.

(Contract NASw-1692)

(NASA-TT-F-12608) Avail: CFSTI CSCL 06P

Formulas are derived for the deformation of cylindrical or prismatic bodies in different directions in space, as well as for the deformations of a tube exposed to internal excess pressure. Discussion of the results gives some indications for avoiding erroneous conclusions in the interpretation of of elasticity measurements on muscle fibers and blood vessels. Author

**N70-10677#** Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. für Flugmedizin.

**INDICES OF FUNCTIONAL CAPACITY DURING PHYSICAL EXERCISE UNDER OXYGEN DEFICIENCY [DAS VERHALTEN VON LEISTUNGSKRITERIEN BEI KOERPERLICHER ARBEIT IM SAUERSTOFFMANGEL]**

J. Uthoff (Ph.D. Thesis-Bonn Univ.) Jul. 1969 61 p refs In GERMAN; ENGLISH summary

(DLR-FB-69-41) Avail: CFSTI

In 12 highly trained athletes the functional capacity under acute hypoxic conditions was examined with a bicycle ergometer at 578 mm Hg by gradually increasing the physical load. Pulse rate, oxygen pulse, oxygen intake and respiratory quotient served as indices of the functional capacity. When at rest, heart rate (+ 5.7 beats/min), oxygen pulse (-0.7 ml/beat) and respiratory quotient (+ 0.04) exhibited significant differences, while the other indices did not. During submaximal work highly significant differences showed up for all criteria except oxygen intake. On the other hand, the maximum values were identical only for heart rates. The expiration volume differed by + 10%, oxygen intake by -10%, oxygen pulse by -9%, respiratory quotient by + 6.5% and the inhale/exhale ratio by + 20%. Author (ESRO)

**N70-10686#** Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N.Mex.

**THE ADVANTAGES OF REARWARD-FACING SEATS DURING POST DECOMPRESSION EMERGENCY DESCENT OF MULTI MACH/HIGH ALTITUDE TRANSPORT AIRCRAFT**

Technical Report, Nov. 1968 - Mar. 1969

Harold J. Von Beckh Jul. 1969 20 p refs

(AD-692508; ARL-TR-69-15) Avail: CFSTI CSCL 6/5

During the post decompression emergency descent of Multi Mach/High Altitude Aircraft the occupants will be subjected to

## N70-10692

deceleration induced inertial loads in the direction of the flight path which will temporarily reach or exceed values of 0.5 G. Forward-facing passengers who have not been able to don the oxygen mask may lose consciousness for various periods of time and will assume positions which are unfavorable for the recovery from hypoxic stress. Aft-facing passengers - even if unconscious - would not lose contact with their seat and seatback and would assume a semisupine position by the combined effect of the aircraft's negative attitude angle and the decelerative load. Recent research suggests that the semisupine position is favorable for recovery from severe hypoxic exposures. A reassessment of the value of aft-facing versus forward-facing passenger seats for subject aircraft is suggested. Author (TAB)

**N70-10692** National Lending Library for Science and Technology, Boston Spa (England).

### **THE VITAMIN C REQUIREMENTS OF THE CREWS OF SEAGOING VESSELS [S-VITAMINAYA OBESPECHENOST EKIPAZHEI SUDOV DALNEISHOGO PLAVANIYA]**

E. P. Boiko Jul. 1969 14 p refs Transl. into ENGLISH from Vopr. Pitaniya (Moscow), v. 27, no. 3, 1968 p 46-52 (NLL-RTS-5232) Avail: Natl. Lending Library, Boston Spa, Engl.: 17s 6d

Male crew members were investigated for dietary vitamin C intake from food products; urinary ascorbic acid excretion; signs of C hypovitaminosis; and response to vitamin supplementation over a two year period. Subjects fed on naval rations obtained from supply bases replenished in foreign ports included engineers and deck hands, daytime and night time workers, under at anchor and at sea conditions. It was concluded: (1) Vitamin C requirements of long distance ship crews depended on provisioning the ships for an adequate diet, the meteorological conditions of the area, and the amount of physical strain. (2) The tropical climate created the greatest need for vitamin C requirements which increased in the engineering crew during the voyage and in the upper deck hands at anchorage. (3) Rapid passage from one climatic zone to another possibly caused a decline in the body's vitamin C reserves. (4) The optimum dose of vitamin C per man in 24 hours is 150 to 175 mgm to be supplemented by dietary doses of 50 to 75 mgm, particularly during the winter/spring period. However, during voyages in the tropics, the optimum dose is 175 to 250 mgm per man in 24 hours, to be supplemented with dietary doses of 75 to 150 mgm. M.H.E.

**N70-10761#** Ohio State Univ., Columbus. Human Performance Center.

### **CONCERNING THE SIMULATION OF DIAGNOSTIC SYSTEMS WHICH PROCESS COMPLEX PROBABILISTIC EVIDENCE SETS Final Report, Aug. 1965 - Aug. 1966**

David A. Schum Apr. 1969 44 p refs (Contract AF 33(615)-2248) (AD-691238; AMRL-TR-69-10) Avail: CFSTI CSCL 5/8

The report provides a theoretical and methodological background for a series of experiments being performed on diagnostic systems. The basic methodology underlying current simulation of diagnostic environments has been changed considerably to achieve the level of task complexity required for the study of certain problems judged to be of significance in real diagnostic systems. In the current series of experiments, the Bayesian evidence aggregation or PIP procedure will be compared with the procedure of having men make direct estimates of posterior probabilities from data. The latter procedure will be referred to as POP. The major reason for continuing the comparison between these two procedures is that results from the POP procedure will provide important additional base-line data in the evaluation of the PIP procedure. Although one can now expect PIP to be generally superior to POP, it will often

be of considerable interest to determine how much superior PIP is in various experimental circumstances. The current simulation methodology allows for several theoretical standards for evaluating the accuracy of posterior probabilities produced by the PIP and POP procedures. Author (TAB)

**N70-10790#** Kollsman Instrument Corp., Syosset, N.Y. Corporate Technology Center.

### **TRANSMISSION OF ENERGY THROUGH INTACT SKIN BY ULTRASONIC POWER Annual Summary Report, 27 Jun. 1967 - 28 Jun. 1968**

J. Kritz and W. M. Nelson 1969 99 p refs (Contract PH-43-67-1415) (PB-185482; ASR-1) Avail: CFSTI CSCL 06L

The report was directed at studying a means of transmitting power through the intact human skin at a level of thirty watts of available power. The technique investigated utilizes the energy transmission via ultrasonic radiation with conversion to useful electrical power while minimizing energy dissipation in the skin interface. Author (USGRDR)

**N70-10801\*#** Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.

### **AN ANALYSIS OF CARBON 14 RADIATION DETECTION SYSTEMS**

K. Wainio Oct. 1969 92 p refs (Contract NAS2-5546) (NASA-CR-73384; BSR-2781) Avail: CFSTI CSCL 06A

Systems for detecting Martian life are described and evaluated. The experiments are designed to investigate soil containing microorganisms and exposed to C-14 labelled organic nutrients, carbon-14 dioxide dark release from soil incubated in labelled carbon dioxide atmosphere simulating Martian daylight, and pyrolysis products from C-14 labelled organic compounds in soils. One principal detector consists of a pair of small detectors mounted face-to-face with the C-14 gas introduced between them. Several designs are described and the study indicates that the semiconductor detectors generally are more satisfactory than the thin window pancake detectors. The other principal detector is a thin plastic scintillation detector wrapped in another scintillator to permit coincidence rejection of background radiations, and preliminary experiments are considered encouraging. Other detection techniques are considered, along with the shielding for the background radiation which is expected to be mainly gamma rays from the radioisotope thermoelectric generator. N.E.N.

**N70-10863#** Continental Can Co., Inc., Chicago, Ill. Metal Div. Research and Development.

### **GROWTH CHARACTERISTICS OF TYPE E CLOSTRIDIUM BOTULINUM IN THE TEMPERATURE RANGE 34 TO 50 DEG F Progress Report**

W. P. Segner and C. F. Schmidt Oct. 1968 6 p refs (Contract AT(11-1)-1183) (COO-1183-28) Avail: CFSTI

The growth characteristics of *Clostridium botulinum* Type E on irradiated (0.1 and 0.2 Mrad) samples of fresh haddock maintained at refrigerated storage temperatures (34 to 50°F) were studied. Samples were inoculated with various numbers of spores and assays for toxin were conducted at various times during the next 40 days. NSA

**N70-10866\*** McDonnell-Douglas Co., St. Louis, Mo. Human Performance Lab.

**IMAGE MOTION STABILIZATION REQUIREMENTS FOR DYNAMIC VISUAL TASKS IN SPACE**

Barry J. Cohen, James T. Miller, and A. John Eschenbrenner 15 Jan. 1969 166 p refs  
(Contract NAS2-4985)

(NASA-CR-73351; G-864) Avail: CFSTI CSCL 06P

An analytical study was performed to determine the requirements for stabilizing images of visual targets to be detected and observed by astronauts in future NASA space missions. An Earth resources survey mission, a Moon landing mission, and a Mars landing mission were used to define physical characteristics that would influence the performance of visual tasks. Expected image velocities of targets in each task were compared with the image velocities defining smear thresholds for human vision, photographic films, and electronic sensors to determine image motion stabilization (IMS) requirements. These requirements were used to develop the functional requirements for an IMS system and a plan for its laboratory and airborne testing. Author

**N70-10874\*** Matrix Corp., Alexandria, Va.

**AN ANALYSIS OF ASTRONAUT PERFORMANCE CAPABILITY IN THE LUNAR ENVIRONMENT. VOLUME 2: PERFORMANCE CAPABILITY SUPPORT DATA**

Thomas B. Malone, Henry E. Bender, and Morton H. Kahn 6 Aug. 1969 315 p refs

(Contract NASw-1751)

(NASA-CR-106663) Avail: CFSTI CSCL 06S

A research project directed toward the objectives of defining astronaut performance capabilities in the lunar environment, and supporting the man-machine interface design, operational procedures, decision rules, and training requirements associated with these items is presented. The study is in these general areas: lunar environment, mission, equipment, operations, and research findings concerning astronaut performance and safety. A description of experiments for astronaut performance on the lunar surface, during early Apollo missions is included. F.O.S.

**N70-10889\*** University of Southern Calif., Los Angeles. School of Medicine.

**BLOOD PRESSURE, SENSOR DEVELOPMENT, ATRIAL SIZE MEASUREMENT, AND IMPLANT MATERIALS Progress Report, 10 Apr. -9 Jul. 1969**

John P. Meehan 14 Aug. 1969 24 p

(Contract NSR-05-018-087)

(NASA-CR-106556) Avail: CFSTI CSCL 06P

During this reporting period the major efforts were concentrated in: (1) completing the development of the blood pressure measuring system, (2) developing a differential venous pressure transducer, (3) investigating implant materials and shapes, and (4) evaluation of atrial size measurement as a redundant measurement for central venous pressures. Author

**N70-10895** National Lending Library for Science and Technology, Boston Spa (England).

**LIFE IN A MAGNETIC FIELD [ZHIZN V MAGNITNOM POLE]**

M. P. Travkin Jul. 1969 16 p Transl. into ENGLISH from Khim. i Zhizn (USSR), v. 9, 1968 p 22-25

(NLL-RTS-5237) Avail: Natl. Lending Library, Boston Spa, Engl.: 10s

The history of magnetobiological research is reviewed and observed effects of magnetic fields on living matter are briefly outlined. Emphasis is placed on the effects of terrestrial magnetism on protoplasm movement in leaf cells, the effects of increased solar activity with intensified electromagnetic fields on epidermic eruptions on humans, and low magnetic field induced disorientations in birds and grain growth directions. Prolonged action of a magnetic field in simulated space conditions caused changes in blood composition of animals and produced conditioned reflexes in fish. The theory is projected that cross-linking of the biological water molecules under the influence of a magnetic field is the basis of its biological action through changing the orientation of the nuclear spin of hydrogen in the water molecule. Also described is a theory that attributes biological effects of a magnetic field to informational reaction of the external electromagnetic field with the living systems by means of the field generated by the organism itself. G.G.

**N70-10906\*** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**EXPERIMENTAL INVESTIGATIONS OF HYPOKINESIA, ALTERED ATMOSPHERES, ACCELERATION, EXCESS g-FORCES AND OTHER FACTORS [EKSPERIMENTALNYE ISSLEDOVANIYA GIPOKINESII, IZMENENNOI GAZOVOI SREDY, USKORENII, PEREGRUZOK I DRUGIKH FAKTOROV]**

6 Jun. 1969 130 p refs Transl. into ENGLISH from collection of Russian Articles

(AD-692624; FTD-HT-23-1311-68) Avail: CFSTI CSCL 6/19

The material is divided into major topics which include: Hypokinesia, Altered Atmospheres, Acceleration and Excess g-Forces, Radiation, Hypothermia, Tissue Cultures, General Problems of Morphology and Physiology, and finally, a Miscellaneous entry. Each of these categories contains a number of pertinent research articles and studies. Author (TAB)

**N70-10907\*** Analytical Mechanics Associates, Inc., Palo Alto, Calif.

**THE CALCULATION OF MOTION DRIVE SIGNALS FOR PILOTED FLIGHT SIMULATORS**

Stanley F. Schmidt and Bjorn Conrad Oct. 1969 77 p refs

(Contract NAS2-4869)

(NASA-CR-73375; Rept-69-17) Avail: CFSTI CSCL 05I

Methods of using computed motion values to obtain signals representing similar motions compatible with the cab's limitations in flight simulators are investigated with the objective of improving the techniques in designing the washout logic circuits. The overall motion simulation problem and some fundamental assumptions about pilot sensed motion are reviewed. Difficulties imposed by motion constraints inherent in motion simulators and traditional washout circuits are described. New concepts are developed incorporating feedback control which provides coordinated drive signals for rotational and translational motions. F.O.S.

**N70-10908\*** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**RADIOTOXINS: THEIR NATURE AND ROLE IN THE BIOLOGICAL EFFECT OF HIGH-ENERGY RADIATION**

A. M. Kuzin, ed. 17 Dec. 1968 378 p refs Transl. into ENGLISH of the book "Radiotoksiny, Ikh Priroda i Rol' v Biologicheskome Deystvii Radiatsii Vysokoy Energii" 2 Moscow, Atomiz Dat, 1966 p 1-293

[AD-69187D; FTD-HT-23-492-68] Avail: CFSTI CSCL 6/18

Theoretical and experimental data are presented on the formation of toxins in irradiated organisms. For individual titles, see N70-10908 through N70-10950.

**N70-10909#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**RADIOTOXINS: THEIR POSSIBLE NATURE AND ROLE IN THE DEVELOPMENT OF RADIATION LESION**

A. M. Kuzin (Inst. of Biophys., USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 4-17 refs (See N70-10908 01-04)

Avail: CFSTI

The effects of radiation on cells and tissues and theories of genetic changes due to radiation are discussed. The dependence of radiotoxin concentration is shown to decrease with increased distance the radiotoxin travels through the medium. The genetic theory that requires a direct hit for radiation to cause a mutation is described and refuted. The theory of hitting multiple structures with radiotoxin formation is also described, and it is pointed out that the radiotoxin concentration increases with time after radiation. The formation of quinones from irradiation and their reactions with enzymes are described. The absence of oxygen at the time of irradiation was found to retard quinone production. Experimental facts which support the role of radiotoxins in the mutagenic effect are presented.

N.E.N.

**N70-10910#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**MECHANISM OF FORMATION AND IDENTIFICATION OF TOXIC SUBSTANCES OF QUINOID NATURE FORMING IN AN IRRADIATED ORGANISM**

V. A. Kopylov (Inst. of Biophys., USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 18-27 refs (See N70-10908 01-04)

Avail: CFSTI

Experiments investigating the nature of the formation of toxic substances are reviewed. The greater concentration of toxins in irradiated organic matter than in nonirradiated media is emphasized. Some of the toxins are identified, and the importance of quinones as one of the primary toxic groups is indicated. The reactivity of quinones, their postirradiation concentration increase, and the effects of enzymes on the oxidation of phenols to quinones are discussed.

N.E.N.

**N70-10911#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**QUANTITATIVE PRINCIPLES OF THE APPEARANCE OF QUINONES IN IRRADIATED PLANT TISSUES AND YEAST CELLS**

N. Norbayev (Acad. of Sci., USSR) and A. M. Kuzin (Acad. of Sci., USSR) *In its Radiotoxins* 17 Dec. 1968 p 28-36 refs (See N70-10908 01-04)

Avail: CFSTI

The increase in formation and excretion of quinones in irradiated corn germinants and diploid wine yeasts were studied. The quinone content in the germinants was found to increase with the dosage and postirradiation time. The excretion of quinones was smaller in irradiated germinants than in the controls when the dosage was below 5 curies. With a dose of 10 curies, the amount

of quinones formed was 300 times more than the amount excreted in 24 hours. Excretion by yeast cells was also found to increase with increased dosage and time after irradiation. The postirradiation formation of quinone in potato tubers, corn germinants, corn seeds, and yeast are noted and compared.

N.E.N.

**N70-10912#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**QUINONE FORMATION IN THE LIVER OF IRRADIATED ANIMALS**

Ye. G. Plyshevskaya et al (Inst. of Biophys., USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 refs (See N70-10908 01-04)

Avail: CFSTI

The initial quinone accumulation in the liver of irradiated white rats was studied quantitatively. Livers were removed 10-15 minutes, and 4, 24, and 48 hours after irradiation with 1 and 4 curies. The quinone accumulation was determined by polarographic and spectrophotometric methods. The accumulation was found to be greater with the higher dosage and to increase with time after irradiation.

N.E.N.

**N70-10913#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**RADIATION ACTIVATION OF ENZYMIC OXIDATION AND THE POSSIBLE ROLE OF THIS PROCESS IN THE FORMATION OF RADIOTOXINS OF QUINOID NATURE**

A. M. Kuzin et al (Inst. of Biophys., USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 44-48 refs (See N70-10908 01-04)

Avail: CFSTI

The radiation effect on the enzymatic oxidation of tyrosine by tyrosinase, leading to the formation of quinones and phenols, is investigated. The acceleration of enzymatic formation was found to increase up to a dose of 1000 r and to decrease with higher dosages. The phenol and quinone concentration in tyrosine solution was shown to increase linearly with dose. Results also indicate that the products of oxidation of tyrosine eliminate the induction period and directly affect the enzymatic reaction rate of the oxidation.

N.E.N.

**N70-10914#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**INHIBITION OF DNA SYNTHESIS AFTER LOCAL IRRADIATION OF CYTOPLASM AND NUCLEUS**

A. A. Vaynson et al (Inst. of Biophys., USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 49-52 refs (See N70-10908 01-04)

Avail: CFSTI

The dose dependence of the inhibition of desoxyribonucleic acid synthesis in cytoplasm and the nucleus of HeLa cells was examined. The rate of synthesis was measured autoradiographically and was found to decrease with increased dose after local and total irradiation. It is concluded that the radiotoxin formation has significance in inhibition of DNA synthesis.

N.E.N.

**N70-10915#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE INTERACTION OF QUINONES WITH CELL NUCLEI**

N. Ye. Lebedeva et al (Inst. of Biophys., USSR Acad. of Sci.) *In*



*its Radiotoxins* 17 Dec. 1968 p 53-59 refs (See N70-10908 01-04)

Avail: CFSTI

The existence of a rapid reaction of radiotoxins with chromosomes was studied in the enzymatic oxidation of tyrosine with rat thymus nuclei. The absorption spectra of tyrosine oxidation products were determined after 10, 15, 30, and 60 minutes of reaction at 30°C. Results indicate that the nuclei actively absorb quinones. Oxidation products of tyrosine were seen to be actively absorbed by thymus cell nuclei. The components responsible for the absorption were also investigated, and the bulk of quinones were found to be bound by deoxyribonucleoproteins, in which the quinones are about 80% associated with histones and the remaining part with DNA. N.E.N.

**N70-10916#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**RADIOMIMETRIC EFFECT OF ORTHO-QUINONES ON THE SORPTION PROPERTIES OF CELL NUCLEI**

Ye. G. Plyshevskaya et al (Inst. of Biophys., USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 60-65 refs (See N70-10908 01-04)

Avail: CFSTI

Fluorescent absorption spectra of rat thymus nuclei in the presence of acridine orange were measured. The effects of the intermediate quinone products of enzymatic tyrosine oxidation on the fluorescence of the nuclei were also studied. It was determined that fluorescence in the presence of acridine orange is duplicated by the products of enzymatic tyrosine oxidation. It was found that fluorescence is dependent upon the intermediate quinone products. Another experiment on irradiated rat liver showed the radiomimetic effect of quinones on fluorescence. N.E.N.

**N70-10917#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE FORMATION OF COMPLEXES WITH THE TRANSFER OF A CHARGE BETWEEN NUCLEOTIDE BASES AND TETRACHLORO-*p*-BENZOQUINONE**

A. M. Kuzin et al (Inst. of Biophys., USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 66-72 refs (See N70-10908 01-04)

Avail: CFSTI

The interaction of tetrachloro-*p*-benzoquinone with guanine, guanosine, cytidine, and xanthine at various polarities of the medium was studied as a model system. Infrared and electron paramagnetic resonance spectroscopy of the reactions shows that nucleophilic substitution takes place by formation of complexes with charge transfer. The ability of the quinones to interact with nucleotide bases can have a great effect on a number of cellular processes, especially those related to transfer of genetic information. A chemical change in the matrix of deoxyribonucleic acid (DNA) has one of two consequences: either the DNA molecule loses the capacity for reduplication or this change may only disturb the correct reading of the sequence of nucleotide bases from DNA to informational ribonucleic acid (I-RNA). The genetic changes resulting from the action of the quinones is explained by interaction of these substances with the nucleotide bases of the DNA molecule. R.B.

**N70-10918#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE EFFECT OF RADIOTOXINS ON DEOXYRIBONUCLEIC ACID SYNTHESIS IN PLANTS**

V. I. Tokarskaya et al (Inst. of Biophys., USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 73-77 refs (See N70-10908 01-04)

Avail: CFSTI

Radiotoxins were extracted from irradiated potato tubers which were first subjected to gamma irradiation from a cesium 137 source. Three-day germinants of a radiosensitive pea variety were placed in extracts of the potato pulp. Two groups of peas were used as controls: one group was placed with their roots in tap water and the other in an extract of unirradiated tubers. After incubation in an atmosphere containing radioactive carbon dioxide, the plants were removed and homogenized, and after total radioactivity of the homogenate was determined, the deoxyribonucleic acid (DNA) was extracted from it. The specific activity of the extracted DNA was determined before hydrolysis with hydrochloric acid and the bases were separated quantitatively by paper chromatography. The adenine, thymine, guanine, and cytosine spots were eluted, and the amount of bases was determined from their ultraviolet absorption spectra. The experiments show that the radiotoxins formed in irradiated plant tissue not only cause inhibition of DNA synthesis by approximately 50% of the control group, but also affect the composition of newly synthesized DNA, decreasing its thymine content (and accordingly increasing the adenine/thymine ratio). R.B.

**N70-10919#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE EFFECT OF RADIOTOXINS FROM IRRADIATED PLANTS ON ANIMAL ASCITES CANCER CELLS**

L. M. Kryukova (Inst. of Biophys., USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 78-82 refs (See N70-10908 01-04)

Avail: CFSTI

Ascitic strains of rat ovary tumors and Ehrlich's mouse carcinomas were subjected to radiotoxins extracted from irradiated plant tissues. Contact action of the extracts on tumor cells studied *in vitro* show that most of them die within the first hour. Death of the cancer cells gradually increases in proportion to an increase in the time that they are in direct contact with the extracts of irradiated plants. The extracts were injected into animals infected with ascitic carcinomas to study their effect on mitotic activity. These *in vivo* studies show that cell division is inhibited within 24 hours after injection. After four to six subcutaneous injections not only is cell division inhibited, but the total amount of ascites and the concentration of cells in one milliliter of ascitic fluid are decreased. At the concentrations used, the extracts are not toxic to the animals. R.B.

**N70-10920#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE COMPARATIVE EFFECT OF GAMMA-RAYS AND RADIOTOXINS OF QUINOID NATURE OF THE GROWTH LOACH ROE**

G. V. Neustroyeu et al (Inst. of Biophys., USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 83-89 refs (See N70-10908 01-04)

Avail: CFSTI

Fertilized loach roe were treated with extracts of quinone radiotoxins (RT) obtained from irradiated potato tubers and exposed to gamma radiation from a cesium 137 source to study the radiosensitivity of the roe at different stages of embryonic development. Results show that the roe are very sensitive to gamma radiation at 2.5 hours of development. Sensitivity drops sharply at 19 hours and then decreases slightly at 43 hours. Roe exposed to brief effects of large RT doses show no detectable difference

in sensitivity at 2.5 and 19 hours, but sensitivity falls sharply at 43 hours. The number of developmental deformities from gamma radiation increases with dose rate and reaches 100% at one curie. Brief action of high RT concentrations produces the same effect, but the total number of deformities does not exceed 30 to 35% of surviving larvae. However, chronic action of small RT doses is very similar to the effect of gamma radiation. The hatching time of egg cells treated with RT concentrations is delayed at exposures of 43 hours, which is analogous to the effects of direct gamma radiation.

R.B.

**N70-10921#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE EFFECT OF PLANT RADIOTOXINS ON THE ANIMAL ORGANISM**

S. K. Melnikova et al (Inst. of Biophys., USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 90-95 refs (See N70-10908 01-04)

Avail: CFSTI

Extracts of concentrated radiotoxins (RT) obtained from irradiated potato tubers were injected into mice to study changes in their weight. Three control groups were used: 1) uninjected mice; 2) injection of 0.2 ml of extract from unirradiated potato tubers; and 3) irradiation of the animals with 700 roentgens of cesium 137 gamma rays. A sharp drop in the animals' body weight is observed in the first two days after injection of plant RT, and subsequent growth lags considerably behind that of the unirradiated control groups. Total gamma radiation produced a pattern similar to plant RT through the first nine days of the experiment. High RT concentrations caused death in the animals. Twenty days after injection, the weight of the liver and testicles of the mice decreased by 17 and 18%, respectively, the weight of the kidneys remained unchanged, and the weight of the spleen increased by 33%. Similar changes in the weight of internal organs were produced by gamma and X-ray irradiation. Rats injected with the RT extracts displayed a sharp drop in the number of leukocytes during the first hours after injection, and continued to lag behind the control group after five days.

R.B.

**N70-10922#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE RECOVERY OF SEEDS FROM RADIATION INJURIES IN THE LIGHT OF THE TOXIN PRODUCTION THEORY**

N. M. Berezina et al (Inst. of Biophys., USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 96-101 refs (See N70-10908 01-04)

Avail: CFSTI

Air-dried corn seeds were irradiated with cesium 137 gamma rays to verify whether prolonged storage contributes to radiation recovery. One group of seeds was planted 24 hours after irradiation, another group 6 months and a third group after 2 years of storage at room temperature. The experiment was repeated with seeds stored after irradiation for 2, 3, and 4 years, and with freshly irradiated seeds. Germinants planted after 24 hours and 6 months storage died with little or no development after several days, while those stored for 2 years or more displayed normal development. It is concluded that post-radiation recovery after prolonged storage is due to elimination of the inflow into the embryo of quinone radiotoxins, which are the principal cause of retardation and death of irradiated seeds, rather than due to recovery of cytogenetic nuclear structures of the embryo damaged by direct radiation effects.

R.B.

**N70-10923#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**RECOVERY OF GAMMA-IRRADIATED SEEDS FROM RADIATION INJURIES**

V. A. Kopylov et al (Inst. of Biophys., USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 102-107 refs (See N70-10908 01-04)

Avail: CFSTI

The hypothesis that washing irradiated corn seeds with water will remove toxic polyphenols produced by the irradiation was examined. Washed and unwashed irradiated and nonirradiated seeds were grown under standard conditions. The washing, which lasted for two days at 4 to 6 C, was found to eliminate radiation inhibition almost completely. An anomaly of the washed irradiated seeds producing at the lowest number without panicles but the same amount of flowering is pointed out. It is suggested that quinones in large quantities are toxic, and in infinitesimal concentration they may act as a stimulant on some metabolic links although they are still toxic for the flowering phase.

N.E.N.

**N70-10924#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE EFFECT OF PROTECTIVE SUBSTANCES ON THE YIELD OF SOME TOXIC PRODUCTS OF AMINO ACID RADIOLYSIS**

N. A. Duzhenkova et al *In its Radiotoxins* 17 Dec. 1968 p 108-111 refs (See N70-10908 01-04)

Avail: CFSTI

Investigations on the products of amino acid and their inhibitors are reviewed. Emphasis on the products is on quinones and 3,4-dioxphenylalanine (3,4-DOPA) and emphasis on the inhibitors is on cysteine hydrochloride and propylgallate. Dependence of tyrosine decomposition and 3,4-DOPA accumulation on gamma ray dosage, and dependence of the protective effect of cysteine hydrochloride on concentration were found, and results are graphed. It is concluded that substances which are good acceptors of free radicals have a high protective effect and prevent the formation of toxic products.

N.E.N.

**N70-10925#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE ROLE OF LIPID RADIOTOXINS IN THE TOXIC RADIATION EFFECT**

Yu. B. Kudryashov (Dept. of Biophys., Moscow State Univ.) *In its Radiotoxins* 17 Dec. 1968 p 112-125 refs (See N70-10908 01-04)

Avail: CFSTI

The primary physiochemical changes, and the triggering mechanisms of radiation injuries in irradiated organisms is discussed in terms of the roles of various toxic substances in radiation lesion, and the establishment of the mechanisms in the toxic radiation effects. Changes in erythrograms of rats irradiated with different doses of gamma rays are analyzed. Lipid RT is considered to be a product of intensified decomposition of lecithin caused by irradiation of the cell. It is concluded that, ionizing radiation causes in irradiated organisms the production of toxic substances which intensify the radiation effect. Some of these are lipid RT, quinones, histamines, choline, and protein decomposition products.

F.O.S.

**N70-10926#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE CHEMICAL NATURE OF LIPID RADIOTOXINS AND THEIR DISTRIBUTION IN ORGANS AND TISSUES**

T. A. Astakhova et al (Dept. of Biophys., Moscow State Univ.) *In its Radiotoxins* 17 Dec. 1968 p 126-132 refs (See N70-10908 01-04)

Avail: CFSTI

The hemolytic activity of the liver, intestine, stomach, kidneys, testicles, muscles, brain, omentum, and blood of irradiated rabbits were studied. The animals were irradiated with a dose of 800 r, and decapitated on the third day after irradiation. Removal of the tissues, their homogenization and extraction were carried out in a cold chamber. The chemical properties of the hemolytically active lipid RT was determined by chromatography. It is concluded that lipid RT is an unsaturated fatty acid and represents a complex mixture of these substances. F.O.S.

**N70-10927#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE FREE RADICAL STATE OF LIPID RADIOTOXINS**

Z. Ya. Baltbarzdys et al (Dept. of Biophys., Moscow State Univ.) *In its Radiotoxins* 17 Dec. 1968 p 133-137 refs (See N70-10908 01-04)

Avail: CFSTI

The behavior as free radicals of lipid toxic substances produced during irradiation of animals is studied. White male mice served as the animals for investigation. The animals underwent one general irradiation with a dose of 800 r. The presence of free radicals was judged by acrylamide polymerization, and it was established that maximum copolymerization with natural tissues begins after four hours. The free radical states of natural radiomimetic (NR) was studied in the liver. It was found that immediately after irradiation the concentration of free radicals was five to six times the normal rate; however, the concentration decreases sharply in the first 24 hours. It is concluded that the NR of irradiated animals is a mixture of unsaturated fatty acids which contain different oxidation products capable of exciting luminescence in the methanol-sodium citrate system. F.O.S.

**N70-10928#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE FORMATION OF LIPID RADIOTOXINS IN ANIMALS AFTER IRRADIATION WITH FISSION NEUTRONS, HIGH ENERGY PROTONS AND Co 60 GAMMA-RAYS**

A. G. Konoplyannikov et al *In its Radiotoxins* 17 Jul. 1969 p 138-143 refs (See N70-10908 01-04)

Avail: CFSTI

The significance of various toxic products of a lipid nature in the development of radiation injury is analyzed by comparing the effects of different types of ionizing radiation in equivalent doses. White male rats were irradiated with 600 MeV protons, and fission neutrons in equivalent lethal doses of 800 rem. Rabbits were irradiated with 130 MeV protons, fission neutrons and Co-60 gamma rays in equivalent doses of 1000 rem. Results on the accumulation of lipid oxidation products are presented in graphs. It is concluded that: (1) The accumulation of lipid oxidation products in the liver of rats irradiated with equivalent doses of different types of radiation takes place in the same way. (2) The activity of NR isolated from the liver of rabbits irradiated with equivalent doses of different types of radiation is also approximately the same. F.O.S.

**N70-10929#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE LIPID RADIOTOXINS OF YEAST CELLS**

V. Olteanu et al (Dept. of Biophys., Moscow State Univ.) *In its Radiotoxins* 17 Dec. 1968 p 144-150 refs (See N70-10908 01-04)

Avail: CFSTI

The toxic lipid products accumulation after irradiation by different doses of ionizing radiation in haploid and diploid yeast cells was studied. The techniques and procedures of the experiment are described, including the growth of the cells, irradiation, and extraction of the lipids. It is concluded that: (1) After gamma irradiation of diploid and haploid yeast cells, toxic lipid products are produced. (2) The activity of lipid radiotoxins (RT) isolated from diploid yeast cells increases with an increase in the irradiation dose. (3) Incubation of irradiated cells in nutrient medium leads to an increase in the activity of the lipid RT extracted from them. (4) Incubation of irradiated yeast cells in tap water has little effect on the activity of the lipid RT. (5) Lipid RT isolated in experiments with yeast cells give a specific reaction to products of unsaturated fatty acid oxidation. F.O.S.

**N70-10930#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE SPECIFICITY OF THE PRODUCTION OF TOXIC LIPID SUBSTANCES (THE EFFECT OF VIBRATION, ELECTRONARCOSIS AND RADIATION)**

Yu. B. Kudryashov et al (Dept. of Biophys., Moscow State Univ.) *In its Radiotoxins* 17 Dec. 1968 p 151-156 refs (See N70-10908 01-04)

Avail: CFSTI

The effect of electrical narcosis and vibration ion radiation injury, and the changes in the production of toxic lipid substances were studied in white male rats. The techniques and procedures of the experiment are described. It is concluded that: (1) Electronarcosis and vibration cause a drop in the oxidation and reduction potential, and a prolonged decrease in the oxygen level in tissues. (2) The effect of stress agents is the production of toxic substances, however, their production is short-lived. (3) The specificity of the production of toxic lipid substances after the irradiation lies in the fact that in radiation injury, in contrast to the effect of electronarcosis and vibration, the production of lipid radiotoxins increases with time. The experimental data are summarized in tables. F.O.S.

**N70-10931#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE JOINT EFFECT OF RADIATION AND AN UNSATURATED FATTY ACID ON ERYTHROCYTES**

Yu. B. Kudryashov et al (Dept. of Biophys., Moscow State Univ.) *In its Radiotoxins* 17 Dec. 1968 p 157-160 refs (See N70-10908 01-04)

Avail: CFSTI

The hypothesis that primary lipid radiotoxins (RT) cause radiation injury in living irradiated cells is investigated by studying the effect of radiation and oleic acid on erythrocytes. A suspension of erythrocytes in oleic acid was irradiated and incubated. At different time intervals the change in the stability of the erythrocytes to a standard hemolytic agent, hydrochloric acid was examined. The experimental data are summarized in tables, and indicate that in the presence of oleic acid an intensification of the radiation effect on erythrocytes occurs. Further experimentation is recommended to explain the effects of the disturbances which occur in the irradiated erythrocytes. F.O.S.

**N70-10932#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE TOXICITY OF LIPIDS IN ANIMAL RADIATION SICKNESS**

M. L. Kakushkina (Dept. of Biophys., Moscow State Univ.) *In its Radiotoxins* 17 Dec. 1968 p 161-168 refs (See N70-10908 01-04)

Avail: CFSTI

A review of the literature concerning the influence of various toxic lipids on the development of radiation injuries of living organisms is presented. The overall conclusions of the review are: (1) The effect of oleic acid on erythrocytes depends on its oxidation, as well as on its fixation on cellular structures. (2) After irradiation of rabbits an increase occurs in the toxic properties of the liver lipids in acting on erythrocytes as well as on isolated mitochondria. (3) An increase in the toxicity of the lipids occurs both in the first two to four hours after the effect and immediately before the death of the animals. The rate of enzymatic autolytic processes increases in the first period after the effect and is lower than normal before the animal's death.

F.O.S.

**N70-10933#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**MORPHOLOGICAL AND HISTOCHEMICAL CHANGES IN THE ORGANS OF ANIMALS SUBJECTED TO THE ACTION OF LIPID RADIOTOXINS**

Ye. A. Shubnikova et al (Moscow State Univ.) *In its Radiotoxins* 17 Dec. 1968 p 169-188 refs (See N70-10908 01-04)

Avail: CFSTI

The highly radiosensitive rat organs were examined after: (1) irradiation with 880 r of gamma radiation, (2) 600 rad of fast neutron, and (3) the injection of lipid radiotoxins obtained from the livers of irradiated rabbits. Morphological and cytochemical changes in cell structure, ribonucleic acid, and lipid metabolism were studied by cytological and histochemical methods. In all the tissues studied both from radiation and from injection of RT, structural changes in the mitochondria and conglomeration, swelling or disappearance of the injured cell were observed. These cytological and cytochemical changes in cells are considered similar to the effect of gamma and neutron irradiation, and the injection of lipid radiotoxins.

F.O.S.

**N70-10934#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE CYTOGENETIC EFFECT OF LIPID RADIOTOXINS**

N. G. Labzina et al (Moscow State Univ.) *In its Radiotoxins* 17 Dec. 1968 p 189-194 refs (See N70-10908 01-04)

Avail: CFSTI

The reaction of natural radiomimetic toxic lipids, in the cells of irradiated organisms, with the genetic material resulting in aberrations, or causing the manifestation of the already present hidden defects is investigated in Ehrlich's ascites carcinoma cells and in loach ova. It is concluded that OOA in causing chromosomal aberrations in cancer cells is a developer of hidden defects existing in these cells. OOA does not have an effect on uninjured chromosomes of normal cells, but does take part in the initial reactions of radiation injury.

F.O.S.

**N70-10935#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE TOXIC EFFECT OF WATER-SOLUBLE OXIDATION PRODUCTS OF IRRADIATED LINOLENIC ACID**

A. S. Mochalina *In its Radiotoxins* 17 Dec. 1968 p 195-200 refs (See N70-10908 01-04)

Avail: CFSTI

Thiobarbituric acid was used to demonstrate the production of water soluble unsaturated fatty acid oxidation products in biological cells after irradiation. Aqueous extracts of irradiated oxidized linolenic acid products interacted with thiobarbituric acid by forming colored solutions with an optical density of 532 millimicron for green filter and of 455 millimicron for blue filter measurements. Characteristic absorption spectra of the colored solution established a direct relationship between the rose color intensity and the total dose of gamma-irradiation. The yield of linolenic acid products responsible for bands at 532 m and at 455 m increased with an increase in the dosage. In order to test the effects of radiative chemical oxidation of unsaturated fatty acids in the development of radiation injuries, elutes were tested on mouse erythrocytes and the infusoria 'Paramecium caudatum.' Results showed that water soluble linolenic acid oxidation products had a hemolytic effect and caused inhibition of parametric division. With an increase in the linolenic acid irradiation dose the toxic effect of these products increased and death of the infusoria occurred.

G.G.

**N70-10936#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**RATE OF ACCUMULATION AND INTERRELATION OF LIPID RADIOTOXINS AND QUINONES**

A. M. Kuzin et al (Inst. of Biophys., USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 201-206 refs (See N70-10908 01-04)

Avail: CFSTI

Biological effects of lipid radiotoxins and quinones and their interrelation characteristics in irradiated organisms were studied on rat and rabbit livers and tissues. Results showed that: (1) quinone and lipid radiotoxins isolated from the tissues did not contain toxically active impurities; (2) phase variations in liver quinone levels at different periods of acute radiation sickness and a gradually increasing lipid radiotoxin level were observed; (3) lipid radiotoxin injection into animals caused a change in quinone level of the liver similar to that which occurred from the effect of ionizing radiation; and (4) quinone extract injections into animals did not change the level of toxic lipid substances.

G.G.

**N70-10937#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE MECHANISM OF DAMAGE TO THE SUPERFICIAL ERYTHROCYTE LAYER BY UNIRRADIATED AND IRRADIATED UNSATURATED FATTY ACIDS**

K. S. Trinchler et al (Inst. of Biophys., USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 207-213 refs (See N70-10908 01-04)

Avail: CFSTI

Toxic effects of radiation and radiation products on rat blood erythrocytes were studied. Irradiated erythrocyte suspensions as well as erythrocyte suspensions incubated with unsaturated fatty acids and then subjected to irradiation under oxidation conditions were analyzed by photocolormetric density measurements. Kinetic curve shifts in percentages relative to the position of a control curve served as measure of erythrocyte damage. Results showed that: (1) injury of erythrocytes by unsaturated fatty acids was controlled by the law of the kinetics of a zero order chemical reaction; injuries to erythrocytes suspended in physiological solution occurred according to Poisson statistics; (2) maximal concentrations of oleic, linolenic, and olinoleic acids causing 100% injuries were in the range of  $(18-22) \times 0.000001$  g/ml; at this concentration the surface of the erythrocyte was completely covered with unsaturated fatty acid molecules; and (3) gamma irradiation of linolenic acid in doses of 10 to 20 kr increased hemolytic activity not connected with the peroxide content.

G.G.

**N70-10938#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**CHOLINE PRODUCTION IN ANIMAL RADIATION SICKNESS**

O. S. Arutyunova et al (Dept. of Biophys., Moscow State Univ.) *In its Radiotoxins* 17 Dec. 1968 p 214-219 refs (See N70-10908 01-04)

Avail: CFSTI

Changes in the level of free and total choline, as well as its connection with the production of other lipid radiotoxins during radiation sickness were studied on white rats. Oxidized oleic acid preparations were injected intraperitoneally and test organs were extracted after irradiation and the amount of choline determined. Phase changes in total and free choline level were already observed after a dose of 800 r. Total choline increased during the first period of radiation sickness in the spleen, liver, and kidneys of the animals whereas a decrease was observed in skeletal and cardiac muscles. Further increases in free choline level and decrease of total choline level during progressing radiation sickness were attributed to intensified autolytic processes in tissues. An injection of lipid radiotoxins triggered phase changes in the amount of liver choline.

G.G.

**N70-10939#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE CHANGE IN THE FREE HISTAMINE LEVEL IN RAT TISSUES FROM THE EFFECT OF PHYSICAL AND CHEMICAL FACTORS**

J. G. Bilushi et al (Dept. of Biophys., Moscow State Univ.) *In its Radiotoxins* 17 Dec. 1968 p 220-225 refs (See N70-10908 01-04)

Avail: CFSTI

The dynamics of free, biologically active histamine accumulations were studied during radiation sickness and after injection of unsaturated fatty acid oxidation products in order to determine the relationship between lipid radiotoxins and the histamine level. Injection of oleic acid oxidation products in rats caused phase changes in the free histamine content of organs and tissues with sharp inhibition of histaminopexic capacity; injection with lipids isolated from irradiated rabbit livers changed the free histamine level similar to radiation induced disturbances. It was concluded that lipid radiotoxins increased the production of histamine during radiation sickness.

G.G.

**N70-10940#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE ROLE OF INCREASED SENSITIVITY TO A NUMBER OF BIOGENIC FACTORS IN THE DEVELOPMENT OF RADIATION TOXEMIA**

Ye. I. Krichevskaya et al (USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 226-231 refs (See N70-10908 01-04)

Avail: CFSTI

The synergetic effect of ionizing radiation and natural radiomimetic on mice and rats was studied by determining the change in sensitivity of their cholinergic receptors to carbocholine and histamine. Results showed that: (1) ionizing radiation caused an increase in rat sensitivity to carbocholine and histamine; (2) increased sensitivity to histamine was attributed to the suppression of histaminopexic tissue capacity and to a disturbance of the penetrability of the hemato-encephalic barriers for histamine; and (3) absence of the same radiation reaction in mice gave an example of species specificity.

G.G.

**N70-10941#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE PARTICIPATION OF CERTAIN BIOLOGICALLY ACTIVE SUBSTANCES IN RADIATION DISTURBANCES OF THE PENETRABILITY OF THE HISTO-HEMATIC BARRIERS**

Ye. N. Gon Charenko (USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 232-236 refs (See N70-10908 01-04)

Avail: CFSTI

The effects of lipid radiotoxins on the penetrability of histo-hematic barriers and their connection with free, biologically active histamine were studied on liver, muscles, and brains of irradiated rabbits. Radioactive phosphorus isotope was used as indicator and the ratio of tissue radioactivity to the radioactivity of blood was the index of penetrability. During the first period of radiation sickness an increase of tissue penetrability took place which decreased in the ensuing period. Injection of lipids isolated from tissues of irradiated animals had a definite radiometric effect on histo-hematic barrier penetrability; in the initial period of radiation sickness penetrability increased but fell sharply below normal during the most acute form of the illness. Changes in penetrability depended on radiation dosage as well as on the content of oxidized products in the lipid radiotoxin. In comparison the rate of decrease in histamine level, just after irradiation, was different in different organs. Histaminopexic capacity of the tissues of animals injected with lipid radiotoxins also decreased during the entire period of illness. It was concluded that lipid radiotoxins from organisms of irradiated animals change the level of free biologically active histamine and aggravate radiation sickness.

G.G.

**N70-10942#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**SOME DATA ON THE NATURE OF TOXIC FACTORS IN RADIATION SICKNESS**

P. D. Gorizontov et al *In its Radiotoxins* 17 Dec. 1968 p 237-249 refs (See N70-10908 01-04)

Avail: CFSTI

The role of the protein component in onset and development of radiation toxemia was studied by analysing the morphological composition of tissue fluids of irradiated dogs with emphasis on the biological effect of the globulin fraction on hemopoiesis and immunobiological reactivity. Immunobiological reactivities were considerably inhibited during irradiation: the skin's bactericidal capacity was decreased, the phagocytic activity of blood neutrophils suppressed, and lysozyme production in the saliva decreased. Increased cytolytic activity in a perfusate of irradiated tissues was considered as washing out of antibodies against cells which were antigenically changed. Injection of gamma globulin from irradiated dogs into healthy animals caused a similar decrease of immunobiological activity as observed in radiation sickness; it was concluded that the toxemic factor in radiation sickness can be the globulin fraction of the irradiated organism's blood.

G.G.

**N70-10943#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE PARTICIPATION OF HUMORAL TOXIC AGENTS IN THE DEVELOPMENT OF SOME SYNDROMES OF RADIATION SICKNESS**

A. G. Sverdlov (USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 250-255 refs (See N70-10908 01-04)

Avail: CFSTI

The pathogenetic role of radiotoxins in syndromes of radiation sickness was investigated; emphasis was placed on the effects of

toxic factors in relatively unexplored aspects of the disease, since much study has already been devoted to changes in the morphological composition of the blood and organs of hemogenesis caused by irradiation. Intact rabbits were injected intravenously with perfusates of an irradiated rabbit femur, which was isolated in a vascular respect from the organism, while control experiments were run simultaneously using perfusates of an unirradiated femur. Results indicated that the manifestations of toxicity are numerous and varied, as are the toxins themselves. It is assumed that in addition to a direct effect on cells and tissues, the toxins participate in autosensitization of the organism, as well as in disturbances in the neuroendocrine regulation. Further analyses of these preliminary findings are recommended. A.C.R.

**N70-10944#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE ROLE OF RADIOTOXINS IN ANIMAL RADIATION SICKNESS**

S. P. Yarmonenko (USSR Acad. of Med. Sci.) *In its* Radiotoxins 17 Dec. 1968 p 256-263 refs (See N70-10908 01-04)

Avail: CFSTI

Considerations concerning the possible role of radiotoxins in the direct and remote effects of irradiation are presented. A comparative study was made of the effect of ionizing radiation and radiomimetic agents of the alkylating type to determine the validity of an hypothesis that the biological effect may be caused not only by short-lived radicals, but also by more stable intermediate products of their further conversions, whose manifestations are imitated by radiomimetics. Experiments using frogs and mice indicate a similar lethal effect in doses of X-rays and HN2 and NH2; these results therefore give further support to the theory, although the nature of the reaction within the animal's cellular structure differs. Investigations of radiotoxins and the remote results of radiation led to the conclusion that humoral factors which determine the development of the remote effect can have quite a different origin than that of the local radiotoxins. The development of these factors in early stages of the illness evidently is due to a disorder of the neuroendocrine regulation and later to a disturbance in metabolism. A.C.R.

**N70-10945#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE MUTAGENIC EFFECT OF EXTRACTS OF VARIOUS ORGANS OF IRRADIATED MICE**

Yu. Ya. Karris et al (USSR Acad. of Sci., Novosibirsk) *In its* Radiotoxins 17 Dec. 1968 p 264-269 refs (See N70-10908 01-04)

Avail: CFSTI

Experiments were conducted using 367 brown mice to determine in which of the irradiated organs the production or accumulation of active substances occurs. The following conclusions were reached: (1) Water-salt extracts from the brain of irradiated mice demonstrate a reliable cytogenetic effect when injected into intact recipients. (2) A similar but statistically unreliable result appeared after injecting a fatty tissue extract. Extracts of intestine, liver, testicles, and spleen, as well as heparinized blood, did not produce an effect. (3) The extracts proved effective only when the organs were irradiated in situ. (4) The observed remote mutagenic effect of radiation may possibly be caused by products of biolipid radiolysis which develop in the irradiated organism. Future studies to determine the relative significance of the resulting chemical mutagenesis following irradiation at different dosages are recommended. A.C.R.

**N70-10946#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE REMOTE EFFECT OF RADIATION ON THE HEMOPOIETIC ORGANS**

A. L. Vygodskaya et al (Inst. of Biophys. USSR Acad. of Sci.) *In its* Radiotoxins 17 Dec. 1968 p 270-274 refs (See N70-10908 01-04)

Avail: CFSTI

Results of studies into the remote effects of radiation in the hemopoietic organs, which are highly radiosensitive and are responsible for the damage at average lethal doses, are reported. Included are investigations of the relative role of the remote effect of ionizing emissions in general radiation injury, the possible mechanisms of this effect, and theoretical hypotheses for reducing such damage. Reactions in unbred, pubescent, male rats of different weights, kept in a normal environment and under the usual diet, were recorded from irradiation of a number of bone marrow karyocytes. Full irradiation and exposure of shielded extremities led to the general conclusion that under ordinary experimental conditions the number of bone marrow karyocytes is sharply decreased in the shielded extremity. A prophylactic injection of protector somewhat decreases this injury. A careful analysis of the contribution made by nonspecific reactions is necessary to obtain information concerning the influence of the true remote effect. A.C.C.

**N70-10947#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE ROLE OF THE METABOLIC PROPERTIES OF REGENERATING TISSUES IN RESISTANCE TO IONIZING RADIATION**

M. F. Popova (Inst. of Animal Morphol., USSR Acad. of Sci.) *In its* Radiotoxins 17 Dec. 1968 p 225-229 refs (See N70-10908 01-04)

Avail: CFSTI

The radioresistant characteristics of tissues during development of a plastic regenerative condition was examined in normal and regenerating corneal epithelia. The data indicate that the regenerative process not only promotes elimination of the dead cells of irradiated tissue, but also provides for its increased radioresistance. Studies of specific metabolic properties of regenerating tissues were carried out as related to the dynamics of their radioresistance, and attention was also focused on the radio-protective role of sulfhydryl compounds. The results of the various experiments indicate a close relationship between radioresistance and the metabolic functions: as a result of the latter function in regenerating tissues, conditions are created which decrease radiotoxin production and the consequent injurious effect of radiation. It appears possible that during regeneration processes conditions are created in the tissues which promote recovery processes both at the tissue and cellular levels. A.C.R.

**N70-10948#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**A STUDY OF THE ROLE OF TOXINS IN RADIATION DAMAGE OF COTTON PLANTS BY MEANS OF GRAFTS**

N. N. Nazirov et al (Inst. of Exptl. Plant Biol., UzSSR Acad. of Sci.) *In its* Radiotoxins 17 Dec. 1968 p 280-286 refs (See N70-10908 01-04)

Avail: CFSTI

Since grafting of an irradiated plant or one of its organs to an unirradiated plant provides a convenient method of determining the role of metabolic changes in the irradiated organism and of

the toxic metabolic products formed as a result, an experiment was conducted using cotton plants of the variety *Gossypium hirsutum* L. Plants grown from ordinary seeds were grafted onto those grown from Cobalt-60 irradiated seeds of the same variety and vice versa. The following determinations were then made: (1) effect of irradiated and unirradiated rootstock on scion's growth and development; and (2) effect of irradiated and unirradiated rootstock on boll size and raw cotton yield in the scion. An interesting phenomenon was also observed in the deformation of bolls both in the scion and in the rootstock resulting from the remote effect of radiotoxins.

A.C.R.

**N70-10949#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE PROPERTIES OF A RADIOTOXIC SUBSTANCE SUFFICIENT TO CAUSE DEATH OF MAMMALS 30 DAYS AFTER IRRADIATION**

V. I. Suslikov (Inst. of Biophys., USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 287-293 refs (See N70-10908 01-04)

Avail: CFSTI

An investigation was made to determine the possible properties of the radiotoxic substance which plays the decisive role in developing processes leading to the death of irradiated animals in the first 30 days following exposure. Results of fractionated irradiation with sublethal doses are presented, indicating that the probability of death decreases with an increase in the time interval between the two fractions. It is assumed that reparation caused by the first irradiation occurs in the time between the two exposures, so that the second dose does not add to the initial one, but to its decreased value remaining at the point of application of the second dose. This decrease is defined as the residual dose, and within the framework of this model, the following natural properties are assigned to the radiotoxic substance: (1) The amount of toxic substance formed is directly proportional to the dose in the range from zero to several thousand R. (2) The time in which the amount of toxic substance reaches its maximum value does not depend on the dose and the site of its production. (3) After reaching maximum value, the amount of the substance decreases with time at a rate proportional to its concentration. (4) The organism dies only when the total amount of toxic substance in the entire body reaches some threshold value.

A.C.R.

**N70-10950#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**THE PARTICIPATION OF RADIOTOXINS IN RADIATION'S REMOTE EFFECT**

L. M. Kryukova et al (Inst. of Biophys., USSR Acad. of Sci.) *In its Radiotoxins* 17 Dec. 1968 p 294-310 refs (See N70-10908 01-04)

Avail: CFSTI

Experiments on sunflower plants were conducted to determine the presence of biologically active substances, or radiotoxins which kill ascites cancer cells, in shielded leaves following irradiation of the scar of the removed upper bud. The results confirm an hypothesis that the remote effect of irradiation on the entire plant, as manifested in the form of morphological deviations, is caused by radiotoxins flowing into the unirradiated portions from the locally-exposed sites.

A.C.R.

**N70-10964#** Oak Ridge National Lab., Tenn.

**PRIMARY LITERATURE IN THE FIELD OF RADIATION PROTECTION**

H. Scheel [1969] 32 p refs Transl. into ENGLISH of Staatliche Zentrale fuer Strahlenschutz, Berlin (East Ger.) Report SZS-17/68 Prepared by Sci. Transl. Serv., Ann Arbor, Mich. (ORNL-tr-2152; SZS-17/68) Avail: CFSTI

Citation data obtained from two volumes of Health Physics and Giornale di Fisica Sanitaria e Protezione Contro le Radiazioni were used to survey the literature in the field of radiation protection. The results showed that: nearly 60% of all citations were derived from journals, about 20% of all cited journals contained 75% of journal citations; journals of medicine and biology were most frequently cited; most of the cited journals were published in the U.S.A.; about 50% of all citations were not older than 5 and about 80% not older than 10 years; and there are two components of literature, the classic and the ephemeral.

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**SECOND PROGRAMMING COURSE ON THE APPLICATIONS OF ELECTRONIC COMPUTERS IN BIOLOGY AND MEDICINE, 10 SEPTEMBER-14 DECEMBER 1968. PART 7: MATHEMATICAL EXERCISES, 2 [2 CORSO DI PROGRAMMAZIONE, ORIENTATO VERSO LE APPLICAZIONI DEI CALCOLATORI ELETTRONICI ALLA BIOLOGIA E ALLA MEDICINA, 16 SETTEMBRE-14 DICEMBRE 1968. PARTE 7: ESERCITAZIONI DI MATEMATICA, 2]**

20 Jan. 1969 76 p In ITALIAN; ENGLISH summary

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This part of a series of lecture notes is relative to a programming course on the applications of electronic computers in biology and medicine. It contains some exercises solved during the course. Functions, their limits and graphs, trigonometric equations, derivatives, integrals and differential equations are given.

Author

**N70-10993#** Istituto Superiore di Sanita, Rome (Italy). Laboratori di Fisica.

**SECOND PROGRAMMING COURSE ON THE APPLICATIONS OF ELECTRONIC COMPUTERS IN BIOLOGY AND MEDICINE, 16 SEPTEMBER-14 DECEMBER 1968. PART 8: STATISTICAL METHODS IN BIOLOGY AND MEDICINE, 1 [2 CORSO DI PROGRAMMAZIONE, ORIENTATO VERSO LE APPLICAZIONI DEI CALCOLATORI ELETTRONICI ALLA BIOLOGIA E ALLA MEDICINA, 16 SETTEMBRE-14 DICEMBRE 1968. PARTE 8: METODI STATISTICI IN BIOLOGIA E MEDICINA, 1]**

25 Jan. 1969 78 p In ITALIAN; ENGLISH summary

(ISS-69/7) Avail: CFSTI

This part of a series of lecture notes is relative to a programming course on the applications of electronic computers in biology and medicine. It contains a brief description of the elements of descriptive statistics and probability theory which are needed for using statistical methods in research.

Author

**N70-10994#** Istituto Superiore di Sanita, Rome (Italy). Laboratori di Fisica.

**SECOND PROGRAMMING COURSE ON THE APPLICATIONS OF ELECTRONIC COMPUTERS IN BIOLOGY AND MEDICINE, 16 SEPTEMBER-14 DECEMBER 1968. PART 9: STATISTICAL METHODS IN BIOLOGY AND MEDICINE, 2 [2 CORSO DI PROGRAMMAZIONE,**

**ORIENTATO VERSO LE APPLICAZIONI DEI CALCOLATORI ELETTRONICI ALLA BIOLOGIA E ALLA MEDICINA, 16 SETTEMBRE - 14 DICEMBRE 1968. PARTE 9: METODI STATISTICI IN BIOLOGIA E MEDICINA, 2]**

25 Jan. 1969 66 p In ITALIAN; ENGLISH summary (ISS-69/8) Avail: CFSTI

This part of a series of lecture notes relative to a programming course on the applications of electronic computers in biology and medicine contains an elementary description of the statistical methods which are based on the analysis of the frequencies and an introduction to the general linear model. Author

**N70-10995#** Istituto Superiore di Sanita, Rome (Italy). Laboratori di Fisica.

**SECOND PROGRAMMING COURSE ON THE APPLICATIONS OF ELECTRONIC COMPUTERS IN BIOLOGY AND MEDICINE, 16 SEPTEMBER - 14 DECEMBER 1968. PART 10: STATISTICAL METHODS IN BIOLOGY AND MEDICINE, 3 [2 CORSO DI PROGRAMMAZIONE, ORIENTATO VERSO LE APPLICAZIONI DEI CALCOLATORI ELETTRONICI ALLA BIOLOGIA E ALLA MEDICINA, 16 SETTEMBRE - 14 DICEMBRE 1968. PARTE 10: METODI STATISTICI IN BIOLOGIA E MEDICINA, 3]**

25 Jan. 1969 67 p In ITALIAN; ENGLISH summary (ISS-69/9) Avail: CFSTI

This part of a series of lecture notes is relative to a programming course on the applications of electronic computers in biology and medicine. This report contains a description of the statistical problems dealing with the analysis of variance and of some relevant nonparametric methods. Author

**N70-11000#** Georgia Inst. of Tech., Atlanta. School of Information Science.

**INDEXING CONSISTENCY AND QUALITY**

Pranas Zunde and Margaret E. Dexter 1969 42 p refs (Grant NSF GN-655) (PB-185400; GITIS-69-08) Avail: CFSTI CSCL 05B

A measure of indexing consistency is developed based on the concept of fuzzy sets. It assigns a higher consistency value if indexers agree on the more important terms than if they agree on less important terms. Measures of the quality of an indexer's work and exhaustivity of indexing are also proposed. Experimental data on indexing consistency are presented for certain categories of indexers, and consistency, quality, and exhaustivity values are compared and analyzed. The analysis of indexing exhaustivity leads to the conclusion that the increase of information as a result of group indexing is a process analogous to the Bradford's law of information scattering, Lotka's law of scientific productivity and Zipf's law of vocabulary distribution. Author (USGRDR)

**N70-11006#** Georgia Inst. of Tech., Atlanta. Office of Information Science.

**REDUCTIONISTIC INFERENCES IN MODERN BIOLOGY**

Lucio Chiaraviglio 1969 32 p refs (Grant NSF GN-655)

(PB-185403; GITIS-69-05) Avail: CFSTI CSCL 06C

The examples of inferences that are considered span classical and molecular genetics. The principal aim of these inferences is to correlate the phenotypic and genotypic properties, functions, and

structures of organisms to their molecular machinery. The inferences are reductionistic bridges between the organic and molecular levels of explanation. The proposal that a gene is a set of contiguous loci of bases in the polymers that are the genetic materials has gained part of its acceptance through a large set of inferences that relate classical genetic structures, map structures, to the structures of these polymers. Most often the evidence for such inferences comes from viral and bacterial systems. The discovery and elucidation of some of the principal structures of macromolecules such as proteins, DNA, and RNA have been obligatory steps in the reductionistic development. Similarly the elucidation of the genetics of organisms which reproduce rapidly and thus are well suited to fine structure exploration of genetic maps was required USGRDR

**N70-11095#** Princeton Univ., N.J. Dept. of Aerospace and Mechanical Sciences.

**FLIGHT EVALUATION OF THE EFFECT OF APPROACH SPEED ON PILOT PERFORMANCE Final Report, Oct. 1967 - Apr. 1969**

Edward Seckel and George Miller Apr. 1969 48 p refs (Contract Nonr-1858(50); Grant NSF GP-579) (AD-691290; Rept-831) Avail: CFSTI CSCL 1/2

Simulated carrier approaches were flown by Navy carrier pilots in a variable stability airplane. The approaches were visual, in daylight, at three closure speeds. Moderate natural turbulence and the carrier turbulence wake were simulated. The longitudinal and lateral-directional dynamics were maintained constant for the three approach speeds with the variable stability airplane. Measures of pilot performance in terms of altitude at the simulated ramp and touchdown distance from the ramp were obtained for the three approach speeds. These data were compared with similar performance measures of carrier approaches of combat experienced pilots. Author (TAB)

**N70-11150#** Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering.

**COMPUTER RECOGNITION OF THREE-DIMENSIONAL OBJECTS IN A VISUAL SCENE**

Adolfo Guzman-Arenas (Ph.D. Thesis) Dec. 1968 290 p refs (Contract Nonr-4102(01)) (AD-692200; MAC-TR-59) Avail: CFSTI CSCL 9/2

Methods are presented: (1) to partition or decompose a visual scene into the bodies forming it; (2) to position these bodies in three-dimensional space, by combining two scenes that make a stereoscopic pair; (3) to find the regions or zones of a visual scene that belong to its background; (4) to carry out the isolation of objects in (1) when the input has inaccuracies. Running computer programs implement the methods, and many examples illustrate their behavior. The input is a two-dimensional line-drawing of the scene, assumed to contain three-dimensional bodies possessing flat faces (polyhedra); some of them may be partially occluded. Suggestions are made for extending the work to curved objects. Some comparisons are made with human visual perception. The main conclusion is that it is possible to separate a picture or scene into the constituent objects exclusively on the basis of monocular geometric properties (on the basis of pure form); in fact, successful methods are shown. Author (TAB)

**N70-11186#** Sensory Systems Lab., Tucson, Ariz.

**BIOTELEMETRY ULTRASONIC TECHNIQUES**

Howard A. Baldwin, Donald L. Brumbaugh, and Dale E. Hall Jun. 1969 18 p refs (Contract Nonr-4315(00))



(AD-691897) Avail: CFSTI CSCL 6/2

Several electronic circuit designs and harness techniques for telemetry of physiological data from free swimming aquatic animals are presented. Included are instruments for transmission of diving depth, heart and muscle potentials and heart sounds.

Author (TAB)

**N70-11203#** Systemed Corp., Dayton, Ohio.  
**THE ACUTE INHALATION TOXICITY OF MONOMETHYLHYDRAZINE VAPOR** Technical Report, Feb. 1966–Nov. 1967

C. C. Haun, J. D. Mac Ewen, E. H. Vernot, and G. F. Egan  
 Wright-Patterson AFB, Ohio USAF Apr. 1969 53 p refs  
 (Contract F33615-67-C-1025)

(AD-691240; W-68003; AMRL-TR-68-169) Avail: CFSTI CSCL 6/20

The lack of adequate data and the increased use of monomethylhydrazine (MMH), a rocket propellant, prompted additional studies of the acute inhalation toxicity of this compound. The reactive nature of MMH necessitated the use of modified test systems designed to minimize the degradation of MMH during animal exposures. Rats, mice, beagle dogs, squirrel monkeys, and rhesus monkeys were exposed to various measured concentrations of MMH vapor for specified time periods. Rodents were exposed for 30-, 60-, 120-, and 240-minute periods; dogs and squirrel monkeys, for 15, 30, and 60 minutes; and rhesus monkeys for 60 minutes only. The toxicity of MMH for the five animal species was defined by determinations of LC50 values, pathology examination of organs, observations of symptoms, measurements of body weight in rats and mice, and blood chemistry and hematology tests on dogs and rhesus monkeys. Squirrel monkeys proved to be the most sensitive and rats the least sensitive to the lethal effects of MMH. MMH exposure produced definite hemolytic changes in dogs and, to a lesser extent, in rhesus monkeys. These experiments show MMH to be a highly toxic compound. Studies are currently in progress to determine the level at which MMH produces no irreversible injury.

Author (TAB)

**N70-11206\*#** Midwest Research Inst., Kansas City, Mo.  
**THE APPLICATION OF AEROSPACE TECHNOLOGY TO BIOMEDICAL PROBLEMS** Quarterly Report, 15 Jun.–31 Aug. 1969

David Bendersky and Donald E. Roberson 31 Aug. 1969 35 p refs

(Contract NASw-1936; MRI Proj. 3332-E)  
 (NASA-CR-106734; QR-1) Avail: CFSTI CSCL 06E

The biomedical applications team (BAT) activities in facilitating the technology utilization of aerospace developments in biomedicine are reported. The status of biomedical problems under consideration including the potential transfers, and a summary of active problems are included. It is considered noteworthy that six of eleven potential transfers were found in manual searches in the MRI-BAT document files, and is indicative of the growing accumulation of pertinent documents in the files. Since it was concluded that the number of transfers is in direct proportion to the number of participating medical institutions, and the number of biomedical problems submitted by the medical institutions, it was decided to increase the number of participating medical institutions.

F.O.S.

**N70-11224#** Scientific Translation Service, Ann Arbor, Mich.  
**CATALASE ACTIVITY DURING MUSCULAR ACTIVITY IN BIRDS** [AKTIVNOS KATALAZY V PROTSESSE MYSHECHNOI DEYATELNOSTI U PTITS]

G. I. Rogachev Aug. 1969 9 p refs Transl. into ENGLISH from Tr. Bashkirskii Selskokhozyaistvennyi Inst. (USSR), v. 12, no. 3, 1966 p 83–87 Sponsored by AEC Prepared for Argonne Natl. Lab., Ill.

(PB-185576T; ANL-Trans-768) Avail: CFSTI CSCL 06P

The individual constant of catalase activity in the muscles of various pigeons is different. Expressing the catalase activity in milliliters of 0.1 N hydrogen peroxide decomposed by catalase, we find a minimum of 383.4 ml and a maximum of 874.0 ml, and an average of 615 ml. In pigeons, catalase activity during muscle exercise shows a significant rise. Fatiguing work causes a significant increase in catalase activity in the muscles and in previously exercised muscles of pigeons; the same amount of fatiguing work significantly increases the catalase activity in pigeons by approximately 30% or more against the resting figures.

Author (USGRDR)

**N70-11279\*#** Research Triangle Inst., Durham, N.C. Engineering and Environmental Sciences Div.

**BIOMEDICAL APPLICATIONS OF NASA SCIENCE AND TECHNOLOGY** Quarterly Progress Report, 15 Jun.–14 Sep. 1969

14 Sep. 1969 69 p refs

(Contract NASw-1950)

(NASA-CR-106733; RTI-EU-468; QPR-1) Avail: CFSTI CSCL 06E

A biomedical applications team presents an experimental program in technology transfer. Significant transfers of technology include a material for hip joint prosthesis developed from low friction space bearings, electromyography in hand rehabilitation, and the development of cardiostachometer circuitry. New investigations include: electroencephalogram and underwater telemetry; measurement of isethionic acid and measurement of calcium; development of a urine disposal unit; a pressure suit for orthostatic hypotense patients; percutaneous tubes for blood dialysis; lightweight cast and splinting material; transducers to measure finger displacement, force, and intracellular pressure; an automatic control for a tilt bed; a motion force amplifier; cardiovascular correlation techniques; and an eye movement measuring device.

Author

**N70-11287#** Georgia Inst. of Tech., Atlanta. School of Information Science.

**A GENERAL INFORMATION SYSTEM FOR LEARNING**

Vladimir Slamecka 1969 24 p refs

(Grant NSF GN-655)

(PB-185405; GITIS-69-02) Avail: CFSTI CSCL 05I

The paper is concerned with the application of information engineering approaches to the design of large general purpose educational systems. The subject is developed through a brief discussion of the following topics: design objectives of future educational systems; an information processing model of the educational process; a basic configuration of a general purpose information system for education; and the state of art of information technology relevant to such a system. The paper concludes with a description of one educational system under study.

Author (USGRDR)

**N70-11309#** Navy Experimental Diving Unit, Washington, D.C.  
**JOINT U.S. NAVY-DUKE UNIVERSITY 1000 FOOT SATURATION DIVE** Final Report

James K. Summitt, James S. Kelley, Jerry M. Herron, and Herbert A. Saltzman 14 Apr. 1969 53 p refs  
(AD-692424; NEDU-RR-3-69) Avail: CFSTI CSCL 6/11

Five experimental subjects were exposed to a simulated depth of 1000 feet of seawater in the Duke University hyperbaric chamber complex. The compression phase was completed over a 24 hour and 22 minute period, an average descent rate of 1.5 minutes per foot. The subjects remained at the 1000 foot depth for 77 hours and 30 minutes. This was followed by 284 hours of decompression, a rate of approximately 15 minutes per foot with four hour stops at ten staging depths. An extensive series of biomedical, diving equipment and human performance tests was conducted during each phase of the dive sequence. Oxygen and carbon dioxide levels were very accurately controlled within safe limits, though the oxygen was manipulated periodically to meet the requirements of specific biomedical experiments. These observations indicate that divers can perform well under these conditions if life support systems maintain a level of support equivalent to that at the surface.

Author (TAB)

**N70-11310#** Navy Experimental Diving Unit, Washington, D.C.  
**DIVER EQUIPMENT TESTS PERFORMED DURING THE JOINT US NAVY/DUKE UNIVERSITY 1000 FOOT SATURATION DIVE Final Report**

John V. Harter 15 Apr. 1969 33 p  
(AD-692423; NEDU-RR-2-69) Avail: CFSTI CSCL 6/11

A series of diving equipment tests were performed at depths of 1000 and 850 feet during the joint Duke University/Navy 1000 feet saturation dive at Durham, North Carolina. Description of tests performed and results thereof are presented for documentation purposes. Recommendations for modifications and further testing are presented.

Author (TAB)

**N70-11312#** Philco-Ford Corp., Palo Alto, Calif. Western Development Labs.

**AN INVESTIGATION OF THE RELATIONSHIP BETWEEN OPERATOR PERFORMANCE AND OPERATOR PANEL LAYOUT FOR CONTINUOUS TASKS Final Report, 15 Jan. 1966 - 15 Sep. 1966**

R. L. Fowler, W. E. Williams, M. G. Fowler, and D. D. Young Dec. 1968 78 p refs  
(Contract AF 33(615)-3439)

(AD-692126; WDL-TR-3586; AMRL-TR-68-170) Avail: CFSTI CSCL 5/8

The study evaluated four principles of control panel layout: sequence of use, functional grouping, optimum location by frequency of use, and optimum location by importance. The four principles were evaluated by experiments which included stress conditions and three levels of application of each of the arrangement principles.

Author (TAB)

**N70-11343** National Lending Library for Science and Technology, Boston Spa (England).

**SIMULATING THE PROCESSING OF DATA ON THE FREQUENCY AND INTENSITY OF SOUND SIGNALS IN THE AUDITORY SYSTEM [MODELIROVANIE PROTSSESA PERERABOTKI INFORMATSII O CHASTOTE I INTENSIVNOSTI ZVUKOVOGO SIGNALA V SLUKHOVOI SISTEMA]**

I. A. Lyubinskii et al Jun. 1969 17 p refs Transl. into ENGLISH from Probl. Fiziol. Akustiki Inst. (USSR), no. 6, 1966 p 209 - 221 (NLL-RTS-5078) Avail: Natl. Lending Library, Boston Spa, Engl.: 32s 6d

Developed is a structural model for data processing in the neuron network of a sonic analyzer situated between the organ of Corti and the projection zone in the auditory cortex. Reactions of the model to monotonic sound signals of long duration are defined in terms of intensity and frequency. An attempt is made to explain transition phenomena which can be observed in electrophysiological investigations. The permissibility of conversions in models of neuron layers is determined by the reliability of relevant conversions in elements of the neuron type.

G.G.

**N70-11356\*#** Southwest Research Inst., San Antonio, Tex.  
**SOUTHWEST RESEARCH INSTITUTE ASSISTANCE TO NASA IN BIOMEDICAL AREAS OF THE TECHNOLOGY UTILIZATION PROGRAM Quarterly Progress Report, 1 May 31 Jul. 1969**

Louis S. Berger, Betty J. Wall, and W. R. Brian Caruth 15 Aug. 1969 85 p refs

(Contract NASw-1867; SwRI Proj. 13-2538)

(NASA-CR-106641; QPR-2) Avail: CFSTI CSCL 05B

Introduction and dissemination of NASA derived technologies to biomedical scientists at research institutions with subsequent transfer to medical practitioners is discussed and a general methodology for the solution of this technical transfer problem is found in the creation of biomedical application teams for the processing of proposals. During the period May through July, 1969, numerous medical problem statements were received by the teams and problem abstracts worked on are attached. They cover a wide range of activities from computer programs and systems for analyses of biomedical samples to instrumentation and measuring methods for electrical body signals, rate and depths of breathing, blood flow and composition, oxygen metabolism, etc.

G.G.

**N70-11366#** Ohio State Univ., Columbus. Human Performance Center.

**AIDED HUMAN PROCESSING OF INCONCLUSIVE EVIDENCE IN DIAGNOSTIC SYSTEMS: A SUMMARY OF EXPERIMENTAL EVALUATION Final Report, 1 Oct. 1965 - 1 Jun. 1966**

David A. Schum, Jack F. Southard, and Louise F. Wombolt Wright-Patterson AFB, Ohio USAF May 1969 69 p refs  
Prepared in cooperation with Rice Univ., Houston, Tex.  
(Contract AF 33(615)-2248; Grant NSF-GU-1153)

(AD-691239; AMRL-TR-69-11) Avail: CFSTI CSCL 5/8

The report describes three experimental evaluations of a procedure for aiding men in combining probabilistic (inconclusive) information. The procedure is called Semi PIP (Probabilistic Information Processing). In the semi PIP procedures, a computer relieves man of part of the task of combining probabilistic evidence. The experiments involved a simulated military threat-diagnosis task in which probabilistic data are used as a basis for deciding among alternative hypothesized threats. The Semi PIP was compared with an unaided procedure called POP (Posterior Probability), and both procedures compared with a mathematically ideal combination of evidence (Bayes theorem). It was found from the three experiments that: (1) overall, the difference between Semi PIP and POP performance was very slight; (2) POP was best when a small total amount of evidence accumulated very rapidly; and, (3) Semi PIP was slightly, though consistently, superior when the total amount of evidence to be evaluated was large, when the total diagnostic impact in a set of evidence was large, or when both these conditions prevailed. Specific implications of the results for diagnostic system design and for research on basic human inference processes are summarized.

Author (TAB)

**N70-11390#** Naval Aerospace Medical Inst., Pensacola, Fla.  
**DYNAMIC RESPONSE OF THE HEAD AND NECK OF THE LIVING HUMAN TO -G SUB X IMPACT ACCELERATION. 1. EXPERIMENTAL DESIGN AND PRELIMINARY EXPERIMENTAL DATA**

Channing L. Ewing, Daniel J. Thomas, George W. Beeler, Jr., Lawrence M. Patrick, and David B. Gillis 26 Mar. 1969 25 p refs  
 (AD-692069; NAMI-1064; USAARL-69-6) Avail: CFSTI CSCL 6/2

A study is underway to determine the dynamic response of the head and neck of living human subjects to -G sub x impact acceleration, using transducers to measure differential displacements and differential angular and linear accelerations of the head with reference to the base of the neck in response to the input acceleration measured at that point. A redundant photographic data system is being used for validation. Preliminary results are presented.

Author (TAB)

**N70-11402\*#** Martin Marietta Corp., Denver, Colo.  
**FLOOR ANALYSIS AND SPECIFICATION FOR PROTOTYPE MOBILITY AND RESTRAINT FOOTWEAR**

A. W. Hanger Nov. 1969 20 p refs  
 (Contract NAS9-9336)

(NASA-CR-102001; MCR-69-524) Avail: CFSTI CSCL 06K

The magnetic analysis and design specification to determine the lightest weight armature, or floor, configuration of a magnetic circuit are presented. The magnetic characteristics of the permanent magnet, the useful air gap, and the iron armature components of the circuit are given. Vanadium permendur, pure annealed iron, and hot rolled, low carbon sheet metal were investigated for the armature materials. The thickness of the armature to maintain 16.2 pound attractive force was determined, and a method to calculate the permeance is outlined. Vanadium permendur was found to be susceptible to impact with regard to retaining high permeability characteristics. It is recommended that the armature design incorporate a smooth, annealed, pure iron material with a thickness of 0.030 inches.

N.E.N.

**N70-11403\*#** Martin Marietta Corp., Denver, Colo.  
**FINAL ANALYSIS/DESIGN AND PROTOTYPE CONSTRUCTION OF A SELECTED MOBILITY AND RESTRAINT DEVICE Final Report**

Arnold W. Hanger, Scott C. Harris, and Arthur A. Rosener Nov. 1969 100 p refs  
 (Contract NAS9-9336)

(NASA-CR-102003; MCR-69-507) Avail: CFSTI CSCL 06K

Mobility and restraint equipment to date was designed for relatively small volume spacecraft. In these vehicles, the crew was always within touch distance of installed equipment and work areas. In anticipation of larger and more spacious spacecraft, a NASA mobility and restraint concept was designed and prototype articles were fabricated. These articles are known as shufflers and use permanent magnets for a normal holding force. The concept utilizes a shuffling technique where both feet maintain constant contact with the surface. The shuffler's major application will be in transporting bulky equipment and assisting in equipment monitoring and adjustments.

Author

**N70-11405\*#** Martin Marietta Corp., Denver, Colo.  
**FINAL ANALYSIS/DESIGN AND PROTOTYPE CONSTRUCTION OF A SELECTED MOBILITY AND RESTRAINT DEVICE Summary Report**

Arnold W. Hanger and Arthur A. Rosener Nov. 1969 19 p  
 (Contract NAS9-9336)

(NASA-CR-102002; MCR-69-513) Avail: CFSTI CSCL 06K

A mobility and restraint device employing the shuffler technique has been designed as primary footwear with permanent magnets imbedded in the ball and heel areas of the sole. The magnets are sized to meet attractive force requirements. The shuffling technique deviates significantly from previous concepts. Both feet remain in continuous contact with the ferrous surface to assure continuous stability. A low coefficient-of-friction material is placed in the ball area of the foot and a high coefficient-of-friction material is placed in the heel and toe areas. The shuffling movement is facilitated by the permanent magnet in the ball area of the foot. The magnet has sufficient strength to maintain contact, but is not strong enough to impede the sliding motion required for this mode of transportation. The pushing force for shuffling originates from the heel area of the foot. Once the shufflers are in place, body twisting, bending, and stretching are readily accommodated. If adjustment must be made outside the man's reach while in a fixed position, simple short shuffling movements can easily reposition the body. In cases when only the individual is involved in transporting bulky or high inertia equipment, a free-fly or swimming mode can be used. The shoes are designed to facilitate easy separation from the floor for this mode.

Author

**N70-11406\*#** North Texas State Univ., Denton.  
**[DETECTION AND EVALUATION OF DEFENSES IN SMALL ANIMALS TO SIMULATED SPACECRAFT ENVIRONMENTS] Final Report, 1 Sep. 1968 - 31 Aug. 1969**

Rufus K. Guthrie 31 Aug. 1969 62 p  
 (Contract NAS9-8479)

(NASA-CR-101993) Avail: CFSTI CSCL 06K

The evidence for either the maintenance or the breakdown of natural defenses, or acquired resistance of small animals exposed to simulated spacecraft environment was studied by subjecting guinea pigs to bacterial strains, at a simulated altitude of 380 to 250 mm Hg, in an atmosphere of pure oxygen to 43% oxygen. The test results are tabulated. It is concluded that the stress produced effects on the leukocytes which resembled those of adrenocortical hormone interaction. The depression of antibody titers in guinea pigs which were shifted in environment at the time of antigenic challenge can be considered to be due to one or more of the following: (1) Proliferation of essential germinal centers of antibody production is reduced by the increased hormonal levels which were produced by the nonspecific stress. (2) Relative shifts occurred in mobility of leukocytes and/or monocytes necessary for initial ingestion and processing of the antigen. (3) Initial inflammatory response, often involved in reaction to antigenic stimulus was inhibited by the hormonal production which came when the atmospheric pressure abruptly changed.

F.O.S.

**N70-11407\*#** Amglo Corp., Chicago, Ill.  
**REFURBISHMENT AND TESTING OF THE INTEGRATED WASTE MANAGEMENT SYSTEM Final Report, Dec. 1968 - Aug. 1969**

P. P. Nuccio, T. L. Hurley, F. Chybik, Jr., and R. A. Bambenek Oct. 1969 98 p refs

(Contract NAS9-9014)

(NASA-CR-101994; FR-3080) Avail: CFSTI CSCL 06K

A system for recovering water from metabolic wastes for use in manned space flights of long duration is investigated. The integrated waste management system (IWMS) includes compression distillation units for recovering water from urine, humidity condensate, concentrated water and slurried feces. A 30-day simulated mission test was performed on an around-the-clock basis for seven days each week. Defects in the IWMS are discussed, and recommended improvements are: (1) use of a chemical disinfectant in the flush water, (2) filter-out suspended solids before feeding fecal slurry into still, (3) use of still that operates at saturation temperatures near cabin temperature, and (4) use of pasteurization temperatures to sterilize the stored potable water.

F.O.S.

**N70-11409\*#** Texas Research Inst. of Mental Sciences, Houston.  
**PERIOD ANALYSIS OF THE ELECTROENCEPHALOGRAM OF THE BASELINE DATA FOR GEMINI 7 Final Report**  
 Neil R. Burch 7 Nov. 1969 33 p refs  
 (Contract NAS9-8254)  
 (NASA-CR-101998) Avail: CFSTI CSCL 06K

A series of electroencephalograms on flight personnel and later on some astronauts was completed. This report presents the *periodic analysis and comparison between normal laboratory situation, simulated flight condition, actual orbital flight, and normative sleep study.* Author

**N70-11430\* i** Sensory Systems Lab., Tucson, Ariz.  
**INITIAL EXPERIMENTS WITH MIGRATING CHELOMIA MYDAS USING TELEMETRY**  
 Howard A. Baldwin, Donald L. Brumbaugh, and Archie Carr Aug. 1968 39 p refs Prepared in cooperation with Florida Univ.  
 (Grant NGR-03-041-001; Contract Nonr-4315(00))  
 (AD-693490; NASA-CR-107300) Avail: CFSTI CSCL 06F

This preliminary report describes two initial tracking experiments using transmitting floats attached by line to migrating green sea turtles, *Chelonia mydas*. Data obtained were incomplete but suggestive that navigation guidance does not depend on olfactory cues in the vicinity of Ascension Island. Author (TAB)

**N70-11433#** Boeing Co., Renton, Wash. Commercial Airplane Div.  
**A COMPUTER PROGRAM FOR CALCULATING ENVIRONMENTAL THERMAL COMFORT**  
 10 Oct. 1969 53 p refs  
 (AD-693321; D6-58411-1TN) Avail: CFSTI CSCL 1/3

This document presents a method and computer program for calculating thermal comfort zones for various environmental conditions. A model is used which simulates the thermal responses of man at equilibrium. Heat transfer losses are calculated as a function of environmental conditions and a heat stress index defined in terms of the evaporative sweating necessary to maintain body thermal equilibrium. Parameters considered include clothing emissivity, nude body area, metabolic heat production, clothing insulation, effective body area factor, relative humidity, and air velocity. A comfort zone is plotted for mean radiant temperature vs air temperature. Author (TAB)

**N70-11442\*#** Matrix Corp., Alexandria, Va.  
**AN ANALYSIS OF ASTRONAUT PERFORMANCE CAPABILITY IN THE LUNAR ENVIRONMENT. VOLUME 1: PERFORMANCE PROBLEMS AND REQUIREMENTS FOR ADDITIONAL RESEARCH**  
 Thomas B. Malone, Henry E. Bender, and Morton H. Kahn 6 Aug. 1969 86 p  
 (Contract NASw-1751)  
 (NASA-CR-106806) Avail: CFSTI CSCL 05I

This study was concerned with surveying and evaluating research findings reporting expected astronaut performance capability in the lunar environment. *Principal conclusions drawn from the review and assessment of research are that the findings are generally incomplete, sometimes questionable, and even contradictory, and that astronaut performance will be adversely affected by the lunar environment. The primary recommendation presented is that an astronaut performance research program be developed immediately which will focus on the research problems, gaps in available data, and the integration of results from different studies. A second recommendation is that emphasis be placed on the combined effects of multiple factors of the lunar environment rather than relying on analysis of individual effects for describing expected performance. For Volume 2, see N70-10874.* Author

**N70-11443\*#** Bolt, Beranek, and Newman, Inc., Cambridge, Mass.  
**A MODEL FOR HUMAN CONTROLLER REMNANT Final Report**  
 William H. Levison, David L. Kleinman, and Sheldon Baron 15 Oct. 1968 150 p refs  
 (Contract NAS8-21136)  
 (NASA-CR-102297; FR-1731) Avail: CFSTI CSCL 05H

A model was developed for predicting the spectral characteristics of human controller remnant in single-display control situations. Remnant is assumed to arise primarily from underlying psychophysical sources such as: (1) observation noise, (2) motor noise, and (3) time-variations in the controller's describing function. *These sources are assumed to be white noise processes that are linearly independent of each other and of the signals circulating through the control system. It is shown that these processes are essentially indistinguishable in terms of their effects on controller behavior, and they are lumped into an equivalent (matrix) multiplicative observation noise source.* Author

**N70-11451#** Illinois Univ., Urbana. Biological Computer Lab.  
**ACCOMPLISHMENTS SUMMARY 1968/1969 OF THE BIOLOGICAL COMPUTER LABORATORY Scientific Report, 1 Jun. 1968 31 May 1969**  
 Heinz Von Foerster 15 Jun. 1969 254 p refs  
 (Grant AF-AFOSR-67-7)  
 (AD-693552; BCL-69-2; AFOSR-69-2333-TR) Avail: CFSTI CSCL 6/4

This report summarizes theoretical, applied, and experimental studies in the areas of computational principles in complex intelligent systems, cybernetics, multivalued logic, and the mechanization of cognitive processes. This work is summarized under the following topic headings: properties of complex dynamic systems; computers and the language problem; a conceptual framework for the study of linguistics; axiomatics of self-reproduction; an automatic stochastic predictor and related processes; automata theory; a method for analyzing complex systems; cascaded computational networks; mathematical modeling of interactions in neurons and nets; an organism with a multilevel goal structure and heterarchic competitive control of its overt behavior; search and evaluation of significant event sequences in automated speech analysis; microscopic physics of information transducers; a visual image processor; tectal organization of *Ambystoma Tigrinum*; a display technique for neurophysiological data; speech analysis using series expansions; an approach to the elimination of free response distortion of an electrical network; adaptive sampling of speech; speech synthesis; and endocrine modeling. TAB

**N70-11455#** Air Force Cambridge Research Labs., Bedford, Mass. Data Sciences Lab.  
**THE PROGRAMMING (P) HYPOTHESIS FOR REMS**  
 Edmond M. Dewan Jul. 1969 19 p refs /ts Physical Sciences Research Papers No. 388  
 (AD-693587; AFCRL-69-0298) Avail: CFSTI CSCL 5/10

The adaptive behavior of higher animals is regarded as implying a spontaneous self-reprogramming process taking place in the brain. This process is assumed to be specifically organized to prepare the animal for its current needs. Secondly, it is then hypothesized that an important part of this takes place during sleep. Then the hypothesis is made more definite by assuming that Stage I-REM sleep (a stage of sleep correlated with subjective dreaming) plays an absolutely fundamental role in this process (that is, it is necessary and sufficient for programming to take place). The consequences of this oversimplified postulate are enumerated in the form of experimental predictions (some of which have already

received dramatic confirmation). The main content of this report deals with experimental predictions and theoretical implications which fall into six categories: (1) Physical aspects, (2) memory aspects, (3) perceptual and sensory-motor aspects, (4) the role of drives and emotions, (5) homeostatic and biorhythmic aspects, and (6) effects of breakdown of programming. Author (TAB)

**N70-11480\*** National Aeronautics and Space Administration, Washington, D.C.

**AEROSPACE MEDICINE AND BIOLOGY A Continuing Bibliography with Indexes**

Oct. 1969 118 p refs

(NASA-SP-7011(68)) Avail: CFSTI CSCL 06E

Subject coverage concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Each entry consists of a standard citation accompanied by its abstract. Author

**N70-11483\*** National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

**THE VISUAL ACUITY IN VIEWING SCALED OBJECTS ON TELEVISION COMPARED WITH THAT IN DIRECT VIEWING**

Edward R. Long, Jr. and Sheila Ann T. Long Washington Nov. 1969 24 p refs

(NASA-TN-D-5534) Avail: CFSTI CSCL 06P

The primary objective was to establish a relationship between the visual acuity in viewing scaled objects on television monitors and that in direct viewing. An investigation of the acuity in viewing scaled objects on a closed circuit television system was made. The data were compared with direct-viewing data taken in earlier studies. In both, the acuity was determined as a function of contrast and background luminance. Author

**N70-11501\*** School of Aerospace Medicine, Brooks AFB, Tex.

**AUTONOMIC RESPONSE TO AUDITORY STIMULATION DURING SLEEP Final Report, 1 Oct. - 15 Dec. 1967**

Richard E. McKenzie Jun. 1969 14 p Submitted for publication

(AD-692982; SAM-TR-69-30) Avail: CFSTI CSCL 6/16

Physiologic data were collected in experiments to determine the extent to which autonomic responses can be evoked in sleeping subjects. The results indicate that no autonomic arousal occurs during sleep in response to verbal stimuli in the form of conditioned nonsense words. Low-level auditory stimulation does produce a generalized effect by altering sleep depth. Author (TAB)

**N70-11512\*** Army Foreign Science and Technology Center, Washington, D.C.

**DETERMINATION OF THE PERMEABILITY TO ODORS OF POLYMERIC PACKAGING MATERIALS**

V. G. Popovskii 1969 11 p Transl. into ENGLISH from Konserv. i Ovoshchesushil. Prom. (Moscow), v. 23, no. 1, 1968 p 22-25 (AD-693064; FSTC-HT-23-227-69) Avail: CFSTI CSCL 13/4

Experiments show aluminum foil to be the only complete protection against penetration by aromatic substances commonly found in fruits and vegetables. A double film of polyethylene and cellophane with a good adhesive is the next best. Other polyethylene based materials are unsatisfactory. Numerical results are given. Author (TAB)

**N70-11538\*** Naval Submarine Medical Center, Groton, Conn.

**THE RELATION OF DUCITION TO DYNAMIC STEREOACUITY**

S. M. Luria and Paul R. Kent 8 Apr. 1969 14 p

(AD-693470; Rept-575) Avail: CFSTI CSCL 6/5

The relation between duction break-recovery (B/R) ratios and localization error in a test of dynamic stereoacuity was examined in 73 young men. Positive (near) localization errors, esophoria, high negative spherical correction, high adductive and low abductive B/R ratios were found to be related. Positive errors were associated with high adductive and low abductive B/R midpoints for esophores, but the relationship for exophores was not clear. The difference between adductive and abductive B/R ratios increased with increasing positive error. The difference between adductive and abductive B/R midpoints was greater for esophores than exophores and increased with increasing positive error. The magnitude of error was related to the magnitude of the spherical correction which the subject wore during the experiment. The direction and magnitude of the localization errors were not much more predictable from the duction measures than from the phorias. Author (TAB)

**N70-11545\*** Naval Medical Research Inst., Bethesda, Md. Dept. of Microbiology.

**EFFECTS OF HIGH AND LOW BAROMETRIC PRESSURES ON SUSCEPTIBILITY AND RESISTANCE TO INFECTION Quarterly Status Report, 1 Jul. - 30 Sep. 1969**

Francis B. Gordon and James D. Gillmore 30 Sep. 1969 14 p ref

(NASA Order R-21-010-010)

(NASA-CR-106831; A-3061A(AS-1); QSR-17) Avail: CFSTI CSCL 06P

An additional experiment has been completed in which observations were made at 2 week intervals on mice being maintained under simulated space cabin atmosphere, hypoxia, or air at ambient pressure. An increased incidence of various types of bacteria was seen in both parabarc groups. The incidence of the various types returned to normal levels when mice were put back to air at ambient pressure in the same chambers following 6 weeks parabarc exposure. In an additional experiment the earlier onset and increased mortality observed in hypoxic mice following challenge with influenza virus was confirmed. Differences between hypoxic and control lung infectivity titers were small. Exposure to hyperbaric-normoxic environments following influenzal aerosol challenge increased the mortality and differences in degree of lung consolidation between test and control groups were in agreement. The effect of hypoxia following intraperitoneal challenge with Cocksackie virus was investigated in mice exposed to simulated 18,000 ft altitude for comparison with previous alterations observed in 11% O at 1 atm. Enhancement of Cocksackie virus infection due to hypoxia was demonstrated by virus titer increase over ambient air control mice. Author

**N70-11567\*** Syracuse Univ., N.Y. Dept. of Physics.

**COMPOUND NET MODEL OF THE CEREBRAL CORTEX Final Report, Feb. 1967 - Nov. 1968**

Erich M. Harth, B. Beek, T. J. Cserrmely, and R. D. Lindsay Jun. 1969 72 p refs

(Contracts F33615-67-C-1413; N00014-67-A-0378)

(AD-692719; AMRL-TR-68-189) Avail: CFSTI CSCL 6/3

The central nervous system is believed to consist of a network of neurons, combining in its structure genetically determined design with probabilistic features. A model is described in which probabilistic nets are used as building blocks from which systems can be assembled, approximating for example the interaction between sensory projection areas in the cortex with cortical association areas. The operation of such compound nets is based

on the dynamics of single probabilistic nets and on a set of assumptions concerning the coding of sensory information into the language of central neuronal activity. Data describing the dynamics of simple nets are presented. It is found that various types of information processing can be explained by applying the hypothesis of synaptic facilitation to compound nets. Sustained neural activity is investigated, particularly the problem of ergodicity. Highly non-ergodic types of reverberations were found both theoretically and by computer simulation for certain types of nets. Author (TAB)

**N70-11569#** Denver Univ., Colo. Dept. of Psychology.  
**THE EVALUATION OF A DYNAMIC VISUAL DISPLAY OF TRANSIENT UNDERWATER ACOUSTIC SIGNALS**

Lawrence E. Hardacre and Joseph Halpern Sep. 1969 26 p refs  
(Contract N00014-68-C-0383)  
(AD-693652; TR-2) Avail: CFSTI CSCL 5/8

Three experiments were designed to evaluate one specific type of visual display of transient underwater acoustic signals. Subjects were provided with acoustic, visual, and redundant acoustic and visual information in an attempt to evaluate the display with respect to the discrimination among three stimulus configurations. The results suggested that intersensory discriminations were superior to discriminations based on either singular mode. The influence of learning factors as potential sources of confounding was discussed. Author (TAB)

**N70-11602#** Indiana Univ., Bloomington. Hearing and Communications Lab.

**AUDITORY SIGNAL DETECTION, CORRELATION AND TRANSMISSION Final Report, 1 Oct. 1963 - 15 Aug. 1968**

James P. Egan 1 May 1969 22 p refs  
(Grants AF-AFOSR-548-64; AF-AFOSR-548-67; AF-AFOSR-548-65; AF-AFOSR-548-66)  
(AD-693629; AFOSR-69-2336TR) Avail: CFSTI CSCL 20/1

The research efforts of the laboratory during the five-year period of the OSR-grants were concerned primarily with two areas of psychoacoustics: (1) the phenomena of masking-level differences, or binaural unmasking, and (2) signal detection theory and psychophysics. The research accomplished is presented in this report as abstracts of the published papers, and are classified under the two headings just mentioned. Author (TAB)

**N70-11603\*#** Public Health Service, Phoenix, Ariz. Applied Microbiology and Planetary Quarantine Section.

**SERVICES PROVIDED IN SUPPORT OF THE PLANETARY QUARANTINE REQUIREMENTS**

Martin S. Favero Sep. 1969 19 p  
(Contract NASr-137)

(NASA-CR-106907; Rept-27) Avail: CFSTI CSCL 06C

The D 125C values for the 103 sporeforming isolates from Mariner-Mars 1969 are being identified for possible correlation between spore type and dry heat resistant type. Levels of microbial contamination in Apollo 11 and quantitative data for the interior and exterior surfaces of lunar module 5 are reported. A total of 1990 and 2041 bacterial colonies were isolated and identified from the Apollo 10 and 11 spacecraft. Biosatellite spacecraft were also tested for microbial contamination. Qualitative and quantitative data from Apollo 10 and 11 were stored in a CDC 3100 computer, and four computer programs were written and tested for compatibility with operating systems. Spacecraft contamination measurements are presented in tabular and graphical representations. J.A.M.

**N70-11616#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**WHAT PSYCHOLOGICAL QUALITIES SHOULD BE CULTIVATED IN PREPARATION FOR FLIGHT TRAINING**

Chun-Hsien Lin 1 Jul. 1969 8 p Transl. into ENGLISH from Hang Kung Chih Shih (Mainland China), no. 3, 1960 p 24-25  
(AD-693456; FTD-HT-23-994-68) Avail: CFSTI CSCL 5/9

A discussion is presented of the psychological qualities that are essential to any successful aviator. These qualities includes quick and accurate judgement, flexible reactions, good apportionment of attentions, flexibility, harmonious actions, good memory, steady morale, and strong will power. Author (TAB)

**N70-11687#** Bunker-Ramo Corp., Canoga Park, Calif. Defense Systems Div.

**GUIDE TO HUMAN ENGINEERING DESIGN FOR VISUAL DISPLAYS**

David Meister and Dennis J. Sullivan 30 Aug. 1969 168 p refs

(Contract N00014-68-C-0278)

(AD-693237) Avail: CFSTI CSCL 9/3

The report is a compilation of the available human factors information related to the design of visual displays. The subjects covered include human performance, display characteristics and the interactions that must be considered in the design of visual display systems. Author (TAB)

**N70-11714#** Naval Submarine Medical Center, Groton, Conn. Submarine Medical Research Lab.

**VISUAL ACUITY UNDER WATER WITHOUT A FACE MASK Interim Report**

S. M. Luria and Jo Ann S. Kinney 19 May 1969 13 p refs  
(AD-693472; SMRL-581) Avail: CFSTI CSCL 6/t6

Visual acuity was measured under water for subjects without face masks and was compared with their acuity in air. The loss of acuity was around 90 percent for the entire group, but there were marked differences for the various sub-groups. Emmetropes suffered the greatest loss in the water; they required targets more than 20 times as big as those they could see in air. Myopes suffered the least loss; they required an increase in target-size by a factor of only seven. There was no correlation between emmetropic acuity in air and in water. Acuity was also measured at various luminances in air while the subjects wore negative lenses of various powers to induce the same type of out-of-focus vision found under water. High and low contrast targets were used. Calculations were made of the approximate target sizes which can be seen under water at various light levels and at the two levels of contrast. Author (TAB)

**N70-11715#** Naval Ship Research and Development Center, Annapolis, Md.

**THE COMPUTATION AND USE OF CONE-TO-ROD RATIO SPECIFICATIONS**

Theodore H. Projector and George K. C. Hardesty Washington Sep. 1969 78 p refs

(AD-693103; ELECLAB-25/69) Avail: CFSTI CSCL 6/16

The note summarizes the principles that underlie the concept of a cone-to-rod ratio (CRR) and supports the use of CRR in evaluating the suitability of light for situations where it is necessary to consider the dark adaptation of personnel. It is pointed out that many existing specifications continue to refer to CRRs that are derived from computations based on a now obsolete table of scotopic

visual efficiency. The logical use of the Commission International de l'Eclairage (International Commission on Illumination) 1951 standard instead of the old data produces CRRs that are quite different numerically but in many instances can be converted from one basis to the other. Figures are given to illustrate the differences. Computational forms are supplied for the entry of spectroradiometric data from sources or of spectral transmittance data from filters to be used with various blackbody light sources as well as several standard nonblackbody sources. Author (TAB)

**N70-11717#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**TRANSPIRATION OF UPPER AND LOWER SURFACES OF A LEAF AT VARIOUS ORIENTATIONS IN THE EARTH'S GRAVITATIONAL FIELD**

V. Z. Kotlyar et al 9 Jun. 1969 9 p ref Transl. into ENGLISH from Dopovidi Akad. Nauk Ukr. RSR, Ser. Geol. Geofiz., Khim. Ta. Biologiya (Kiev), no. 8, 1967 p 746-750

(AD-693007; FTD-HT-23-468-68) Avail: CFSTI CSCL 6/3

Changes were noted in the transpiration of the upper and lower surfaces of a leaf rotated so the surfaces are 180 degrees from their natural orientation with respect to the earth's gravitational field. Undetached sugar beet leaves were used in the study. When the morphologically lower side of the leaf blade is turned up, its transpiration rate increases rapidly, while the rate for the upper side of the leaf (now in the underneath position) is reduced. The ratio of the upper/lower leaf transpiration is lowered. On returning to its natural position, transpiration of the lower leaf drops and then increases somewhat. Thus, when the leaf is rotated so the gravity vector enters the lower epidermis, transpiration through the upper epidermis is inhibited by the effect of the gravitation field. According to the proposed mechanism for this reaction, when the orientation of the leaf with respect to the gravitational field is changed, the cells regulate the water vapor diffusion process of the stoma breathing cavity differently than when the leaf is in its natural position. Author (TAB)

**N70-11741#** California Univ., Los Angeles. Graduate School of Business Administration.

**DECISIONMAKING UNDER AGGREGATE UNCERTAINTY: THE ENGINEERING DECISIONS IN A SYSTEM DEVELOPMENT PROJECT Final Report**

Frederic S. Timson (Ph.D. Thesis) Jun. 1969 224 p refs (Contract NO0014-67-A-0111)

(AD-693213) Avail: CFSTI CSCL 5/1

The report presents a technique for analyzing decisionmaking under aggregate uncertainty. The technique is constructed in such a way that it can be used as a tool to evaluate policies for decision-making or to evaluate the influence of multiple incentive contracts. The technique combines engineering and decision making analyses into a simulation model of system development. The simulation model has two parts: a model of a system development project and a model of the decision and information processes in system development. Author (TAB)

**N70-11843#** North Carolina Univ., Chapel Hill.  
**EFFECTS OF IONIZING RADIATION ON PLANT SPECIES, POPULATIONS, AND ECOSYSTEMS Progress Report, 1 Sep. 1968-31 Aug. 1969**

J. Frank Mc Cormick 31 Aug. 1969 28 p refs

(Contract AT(40-1)-3299)

(ORO-3299-20) Avail: CFSTI

The ecological effects of gamma and beta radiations were analyzed. Studies of species physiology, morphology, growth, and

survival under defined conditions were utilized as baselines against which the effects of radiation and other environmental parameters were compared. One specific objective was to analyze the effects of ionizing radiation upon the physiological tolerances of plant species, and the reciprocal effects of physiological stresses upon species radiosensitivities. The effects of gamma and beta radiations on natural ecosystems that contain the same plant species selected for physiological studies in the laboratory were also analyzed. Results of the lab and field studies were compared in an attempt to derive logical hypotheses for ecosystem responses to combinations of radiation and other stresses. Comparisons were made of the radiosensitivities of major ecosystems of the Southeastern United States. From these comparisons one can predict the ecological effects of nuclear war. NSA

**N70-11895\*#** Naval Aerospace Medical Inst., Pensacola, Fla.

**ASSESSMENT OF SEMICIRCULAR CANAL FUNCTION. PART 1: MEASUREMENTS OF SUBJECTIVE EFFECTS PRODUCED BY TRIANGULAR WAVEFORMS OF ANGULAR VELOCITY**

Fred E. Guedry, Jr., Gale G. Owens, and Joel W. Norman 16 Jun. 1969 18 p refs Prepared jointly with Army Aeromedical Res. Unit

(NASA Order R-93)

(NASA-CR-106908; NAMI-1073; USAARL-69-7) Avail: CFSTI CSCL 06P

Two methods were compared for measuring subjective angular displacement produced by triangular waveforms of angular velocity while subjects (N=11) were enclosed in a vertical-axis rotation device that excluded visual and auditory cues of angular motion. Accuracy of subjective estimates was influenced by the methods and by the magnitudes of the accelerations comprising the stimulus waveforms. Results suggest that one of the methods, with slight modification, will provide reliable indication of the subjective effects of controlled semicircular canal stimulation. A follow-up experiment, reported separately, deals with this modification. Author

**N70-11982#** California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.

**EFFECT OF IONIZING RADIATION ON THE BIOCHEMICAL DIFFERENTIATION OF THE RAT BRAIN**

Jean de Vellis and Ole A. Schjeide [1969] 38 p refs

(Contract AT(04-1)-GEN-12)

(UCLA-12-725) Avail: CFSTI

Irradiation (100 R to 1500 R) to the heads of two-day-old rats inhibited differentially the subsequent developmental increases of nucleic acids, individual enzymes, total protein, myelin and total lipid in the rat brain stem and cerebral hemispheres. When irradiation was administered at later ages a decrease in inhibition was observed with increasing age. However, the age at which radioresistance started differed widely between parameters. Glycerol phosphate dehydrogenase (GPDH) (E.C. 1.1.1.8) and isocitrate dehydrogenase (E.C. 1.1.1.42) were radiosensitive during a longer period of their development than malate dehydrogenase (E.C. 1.1.1.37), lactate dehydrogenase (E.C. 1.1.1.27) and malic enzyme (E.C. 1.1.1.40). Myelination was found mostly radioresistant by the time of its onset. Observed inhibitions took place after a delay; they were dose-dependent and showed no recovery to normal levels. Author (NSA)

**N70-12000#** Laboratoire de Physiologie Acoustique, Jouy-en-Josas (France).

**BIOPHYSICAL RESEARCH ON THE CETACEAN'S EAR BONES**

Dominique Giraud-Sauveur (Ph.D. Thesis ---Paris Univ.) Oct.

1968 117 p refs  
(Contract F61052-67-C-0063)

(AD-693217) Avail: CFSTI CSCL 6/3

Certain physical properties of the ossicles of the middle ear in Odontocete Cetacea were studied in relation with the distinct perception of echolocation echoes and of the ultrasonic frequencies which they include. The research was made in comparison with other species, aquatic, amphibious, terrestrial and flying, which employ, or do not employ, sonar systems. Measurements were made for the following points: density, mineral analysis, speed of sound propagation, X-ray diffraction patterns, microradiography and electron microscopy, at once on different ossicles, and in comparison with cranial bones. Author (TAB)

**N70-12023\*#** Avco Corp., Lowell, Mass. Space Systems Div.  
**MICROBIOLOGICAL INVESTIGATION OF SELECTED SPACECRAFT PARTS AND MATERIALS Final Report**

25 Dec. 1967 296 p ref Prepared for JPL

(Contracts NAS7-100; JPL-951577)

(NASA-CR-107009) Avail: CFSTI CSCL 06M

Selected spacecraft parts and materials were assayed for the number of bacteria and fungi on their surface. Data were obtained either for 100 samples of a given part generally divided into 5 separate manufacturing lots or for 25 samples of one lot; frequency distribution of the microbial burden on the parts sampled was obtained. For the assay of each part, the samples were rinsed in peptone water by mechanical shaking or ultrasonication. Aliquots of the rinse solution were then plated on trypticase soy agar and incubated aerobically and anaerobically at 32 C. Data for vegetative bacterial and fungi and bacterial and fungal spores were recorded for each aliquot plate and for the sample part plate. Bactericidal and bacteriostatic assays were carried out on certain aliquot plates and plated samples that exhibited zero counts. A computer program in Fortran 4 was written to compute the averages, standard deviations and values included in frequency distributions. The results indicate low biological burden on most of the parts; in general, electronic components had a lower burden than the polymeric materials. The silicone rubber and potting compounds were found to be highly contaminated. Author

**N70-12085#** Public Health Service, Las Vegas, Nev. Southwestern Radiological Health Lab.

**RADIOIODINE STUDIES FOLLOWING THE TRANSIENT NUCLEAR TEST (TNT) OF A KIWI REACTOR**

S. C. Black, D. S. Barth, R. E. Engel, and K. H. Falter May 1969 92 p refs

(SWRHL-26r) Avail: CFSTI

In conjunction with the transient nuclear test of a Kiwi reactor, on January 12, 1965, hay contamination and controlled dairy cow ingestion studies for radioiodines were conducted. The studies were designed to simulate the maximum possible radioiodine uptake by dairy cows under winter dairy farming conditions, where radioiodines enter the cows via ingested, contaminated hay. The kinetics of the secretion of radioiodines in milk under the conditions of this experiment were determined. Peak values of 830 pCi/liter for I-133 and 150 pCi/liter for I-131 were observed in the milk of individual cows. For I-131 the effective half-life in the milk of Group I cows was found to be 5.7 days, whereas for Group II it was 2.9 days. Air sampling results indicated that the contaminant ingested by Group I cows was less gaseous in nature than was the contaminant for Group II cows. NSA

**N70-12092\*#** Ohio State Univ., Columbus.

**EFFECT OF SPACE ENVIRONMENT ON MAN'S RESPONSE**

**TO INFECTION A Review of Literature and Annotated Bibliography**

Harold V. Ellingson, Joseph F. Tomashefski, Frederick H. Shillito, and John F. Foster Washington NASA Dec. 1969 60 p refs

(Contract NSR-36-008-108)

(NASA-CR-1487) Avail: CFSTI CSCL 06S

A review of the literature on the influence of the space environment to human resistance to infections is presented. Subjects covered are: radiation and infection in space flight, changes in atmospheric composition and pressure, space foods, weightlessness, confinement with minimal hygiene (chamber studies), and combined factors of space Operations. It is concluded: (1) Microbial infections may be a problem during prolonged space flight. (2) Altitude, cold, hypoxia, and other stresses increase susceptibility of some animals to infection. (3) Some noxious trace contaminants are known to increase susceptibility. (4) No changes in autoflora have thus far been detected. Recommendations for additional research, and precautions for protecting crews are included. F.O.S.

**N70-12131#** Joint Publications Research Service, Washington, D.C.

**BIOMEDICAL RESEARCH**

*In its Upper Atmosphere and Space Res. in the USSR in 1968* 1 Aug. 1969 p 42 52 (See N69-12126 02-30)

Avail: CFSTI

Reported are a number of human and animal studies on simulated weightlessness effects using methods of clinical physiology, biochemistry, roentgenology, and other techniques. Evaluated were stress factors characteristic for the transition from weightlessness to ground conditions, body changes due to prolonged hypodynamia, as well as radiation exposure effects on mammalian systems and biological specimens. A series of experiments also evaluated life support systems with oxidative-catalytic and oxidative-sorption methods, respectively. Bioengineering work demonstrated that life-support systems based on the regeneration of products of human vital activities successfully cycled matter with high coefficients of regeneration of water and oxygen. G.G.

**N70-12147#** Harvard Univ., Cambridge, Mass.

**PROJECT TACT Final Report, Jul. 1964 Mar. 1968**

1 Oct. 1968 40 p refs

(Contract F19628-68-C-0300; ARPA Order 952)

(AD-692782; ESD-TR-69-121) Avail: CFSTI CSCL 5/9

The project objective has been to determine what creative thought processes can best take advantage of new technology in computer hardware and software. The plan has been to acquire or develop on-line computer systems of significant mathematical power, and to explore their use in vivo in teaching and research situations. The main product of project research is THE BRAIN (The Harvard Experimental Basic Reasoning And Instructional Network), an interactive computing system which operates on a standard IBM 360 Model 50 under the standard IBM operating system OS. This working system is easy and flexible to use in mathematical and engineering investigations as well as in teaching, and has been engineered for straightforward exportation from Harvard. Author (TAB)

**N70-12151#** Naval Oceanographic Office, Washington, D.C.

**SOME BIOLOGICAL OBSERVATIONS ON THE WHITE WHALE FROM THE AIRCRAFT [NEKOTORYE BIOLOGICHESKIE NABLYUDENITY ZA BELUKHOI S SAMOLETA]**

V. M. Belkovich 1968 19 p refs Transl. into ENGLISH from Zool. Zh. (Moscow), v. 39, no. 9, 1960 p 1414 1422

(AD-693583; NOO-TRANS-403) Avail: CFSTI CSCL 6/3



On the basis of observations on the white whale carried out from the airplane in June and July 1957 in the White, Barents and Kara Seas, it was found that in summer herds of up to 10 animals are prevailing (54.9% of occurrence). Single animals and aggregations of several hundreds are seldom observed (16.1 and 3.2% of occurrence, respectively) and represent a temporary phenomenon. The main constant group of the herd is a female with one-three young of different age; during the breeding season these groups are joined by males, and a mixed herd consists of groups of two-five animals in each. Herds of adult white whales without the young seem to consist of males only which form groups of 3-15 animals. The time of bearing young somewhat shifts in white whales with their advance eastward; in the White Sea they bear young in the mid or the end of June, in Barents Sea in early July, in the Kara Sea in mid-July. Author (TAB)

**N70-12152#** Information Research Associates, Inc., Waltham, Mass.

**A NONPARAMETRIC APPROACH TO PATTERN RECOGNITION. PART 2. THE NON-DISJOINT CASE**

Joel Owen and Ernest G. Henrichon, Jr. 4 Oct. 1968 19 p refs

(Contract Nonr-4752(00))

(AD-693144; TR-17) Avail: CFSTI CSCL 9/4

In Part I of this paper, (AD-664 218), a nonparametric discrimination technique was proposed. It was shown there that when perfect discrimination was possible, this technique achieved perfection and in certain cases achieved it with a finite learning phase. In this report, the technique is modified to include the case when perfect discrimination is not possible. It is shown that this procedure yields results which converge in probability to the optimal decision boundaries determined by the likelihood ratio method.

Author (TAB)

**N70-12179#** Royal Air Force, Farnborough (England). Flying Personnel Research Committee.

**THE SERVICE TRIAL OF NEW AIRCRAFT EQUIPMENT ASSEMBLIES IN LIGHTNING AIRCRAFT**

G. L. Smith Dec. 1968 29 p refs

(FPRC/Memo-243) Avail: CFSTI

The service trial of a new series of garments for the Lightning aircrew which may be worn in six different assemblies is described. The new garments, method of training pilots in their use, and the results obtained from the trial are described. Suggested modifications to the garments, based on comments made by the pilots, are detailed. These modifications should improve the acceptability of the garments, which even in their present form were considered a great improvement on the aircrew equipment assemblies at present in use. Author

**N70-12195\*#** Exotech, Inc., Washington, D.C. Systems Research Div.

**DEVELOPMENT AND APPLICATION OF A SYSTEM MODEL FOR SPACECRAFT STERILIZATION Final Report**

Aug. 1969 87 p refs

(Contract NASw-1558)

(NASA-CR-107041; TR-SR-70-03) Avail: CFSTI CSCL 06M

A mathematical model applicable to the analysis of spacecraft sterilization requirements was developed, based principally on heat sterilization practices. The planetary quarantine implementation model is given in the form:  $P(N) \leq R$ , where  $P(N)$  denotes the probability that the mission contaminates the planet and where  $R$  denotes a prescribed maximum allowable value for  $P(N)$ . The

different ways in which heat sterilization can be distributed between a terminal cycle flight acceptance testing and piece-part testing are considered pertinent to the implementation of heat sterilization with a minimization of terminal sterilization time, and the avoidance of heat penetration into materials. Recommendations for modifications, and additional research are included. F.O.S.

**N70-12230#** Atomic Energy Commission Research Establishment, Risø (Denmark). Accelerator Dept.

**MICROBIOLOGICAL CONTROL OF RADIATION STERILIZATION OF MEDICAL SUPPLIES. PART 2: NUMBER OF MICRO-ORGANISMS ON MEDICAL PRODUCTS PRIOR TO STERILIZATION AS A FUNCTION OF THE STORAGE TIME BETWEEN PRODUCTION AND MICROBIOLOGICAL CONTROL**

Ebbe Ahrensburg Christensen, Claus Emborg, and Niels W. Holm Apr. 1969 10 p refs

(RISO-194) Avail: CFSTI

Five cc disposable hypodermic syringes were contaminated with a number of different micro-organisms, and the number of surviving organisms per syringe was followed for four weeks after contamination. When stored in a dried condition, *E. coli* was quickly inactivated, and a considerable decrease in the number of staphylococci was observed. As was expected, endospores of *B. subtilis* withstood storage in a dried condition very well.

Author (ESRO)

**N70-12243#** Commissariat à l'Energie Atomique, Grenoble (France). Lab. de Radiobiologie.

**EVOLUTION OF GLYCEMIA IN THE BLOOD OF MICE IN THE PRESENCE OR ABSENCE OF IMIDAZOLE [EVOLUTION DE LA GLYCEMIE SANGUINE CHEZ LA SOURIS PROTEGEE OU NON PAR L'IMIDAZOLE]**

Michel Polverelli and Robert Teoule Aug. 1969 23 p refs In FRENCH; ENGLISH summary

(CEA-R-3809) Avail: CFSTI

Because of its radioprotective properties the action of the heterocyclic compound imidazole on blood sugar levels of mice irradiated with a lethal dose, has been studied. It was found that there was a hypoglycemic action of the imidazole, an abolishment of the post-irradiation hyperglycemia by imidazole and an appreciable difference between male and female towards irradiation.

Author (ESRO)

**N70-12244#** Commissariat à l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucléaires.

**EXTRACORPOREAL IRRADIATION OF CALF BLOOD: EFFECTS ON THE LYMPHOCYTES, THE BLOOD-PLATELET FUNCTION, SERIC PROTEINS AND FIBRINOGEN [IRRADIATION EXTRACORPORELLE DU SANG DE VEAU: EFFETS SUR LES LYMPHOCYTES, LA FONCTION PLAQUETTAIRE, LES PROTEINES SERIQUES ET LE FIBRINOGENE]**

Daniel Hollard, Michel Susillon, Yvette Benabid, Evelyne Concord, Michèle Ivanoff et al Aug. 1969 35 p refs In FRENCH; ENGLISH summary

(CEA-R-3864) Avail: CFSTI

The present paper reports the results obtained after extracorporeal irradiation of circulating blood of calves. Animals are divided in 3 groups as follows: control animals (blood circulation without irradiation) calves which received 40 000 rads during 24 hours of continuous irradiation; calves which received the same dose, but administered during a period of 5 days (5 hours every day). It was found that the early lymphopenia which persisted for 7 or 8 weeks may be related to the change of immunoglobulins. A constant hyperfibrinemia (12 g/l) was also discovered and several hypotheses are advanced to explain this phenomenon.

Author (ESRO)

**N70-12287#** Commissariat à l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucléaires.

**DETERMINATION OF IRON ABSORPTION AND EXCRETION BY WHOLE-BODY COUNTING  
[DETERMINATION DE L'ABSORPTION ET DE L'EXCRETION DU FER PAR LA METHODE DE COMPTAGE GLOBAL HUMAIN]**

Daniel Hollard, Yvette Benabid, Martine Berard, Jean Bonnin, Jean Darnault et al Aug. 1969 21 p refs In FRENCH (CEA-R-3542) Avail: CFSTI

Using a whole-body counter, the Fe-59 absorption and loss in 8 normal subjects and in 30 iron-deficient patients was studied. Results showed that whole-body counting provided an excellent and simple method for iron retention measurements, obviating many inaccuracies of previous techniques. Normal absorption of radio iron with this procedure has ranged from 9 percent to 20 percent of the administered tracer in normal subjects, with a mean of 15 per cent. A significant increase in Fe-59 absorption was noted in 21 iron-deficient patients in whom the retention ranged from 40 to 100 per cent. However, 3 iron-deficient patients were found to have low absorption, and their severe iron deficiency would be correlated with this malabsorption. This method permits also the determination of the rate of iron excretion during the following months and therefore the study of the mechanism of some pathological loss. Author (ESRO)

**N70-12312#** Oak Ridge Associated Universities, Tenn. Medical Div.

**COUNTING CHARACTERISTICS OF A MEDIUM-LEVEL WHOLE-BODY COUNTER**

Hirotake Kakehi, W. D. Gibbs, and R. L. Hayes Aug. 1969 29 p (ORAU-108; TID-4500) Avail: CFSTI

The operational characteristics of the diagnostic-level whole-body counter developed at the Oak Ridge Associated Universities, Medical Division are described. This instrument consists of four 3-in. diameter x 3-in. thick sodium iodide crystal detectors mounted in a 1-1/4-in. thick trough-like lead shield and was designed to measure radionuclides in humans in the range from 0.1 to 100 microcuries. Experiments performed and results obtained with the medium-level whole-body counter in a search for distribution-independent energy bands for counting a number of different radionuclides are discussed. NSA

**N70-12327#** Space Sciences, Inc., Waltham, Mass. Biosystems Div.

**RESEARCH IN DESIGN AND DEVELOPMENT OF A FUNCTIONAL MODEL OF THE HUMAN NONAUDITORY LABYRINTHS Final Technical Report, May 1966 - Dec. 1967**

Laurence R. Young and Jacob L. Meiry Mar. 1969 126 p refs (Contract AF 33(615)-5038) (AD-692717; AMRL-TR-68-102) Avail: CFSTI CSCL 6/4

A functional model of the human vestibular system was designed and built. The vestibular model consists of two major subassemblies, a three-axis gimbal system for simulating head motion and a special-purpose analog computer which permits simulation of the semicircular canal and otolith dynamic response and nonlinearities. The gimbal system head simulator can be driven through the computer or independently. The entire 'head' may be placed on an aircraft or in a centrifuge or other motion device. The inner gimbal, representing the skull, carries nine inertial sensors to detect the head motion in inertial space. A three-axis rate gyro package detects angular velocity, as inputs to the six semicircular canals. Six single-axis linear accelerometers, three for each ear, detect the specific force inputs for the otolith gravireceptors. The distance between the two ears may be varied by a physical adjustment. The analog computer provides for simulation of the output of each of the twelve vestibular channels. Author (TAB)

**N70-12357#** Life Sciences, Inc., Fort Worth, Tex.

**HUMAN FACTORS IN FIELD TESTING**

W. G. Matheny Apr. 1969 77 p refs

(Contract N00014-67-C-0315)

(AD-693110; LS/TR-69-1) Avail: CFSTI CSCL 1/3

The problem of human factors field evaluation within the Navy was examined for the purpose of formulating recommendations for improved evaluative methods and techniques. It was concluded that human factors evaluation does not receive emphasis or support comparable to that given equipment evaluation or commensurate with the importance of the human operator to the successful functioning of the system. Much more definitive and timely information must be provided the human factors field evaluator, evaluations must be more mission oriented rather than cockpit centered, the role of the mock-up inspection needs redefinition, assignment of trained Navy human factors personnel to advise and assist the contractor during development is recommended as is assignment of contractor human factors personnel during field evaluations, close cooperation between human factors and equipment design evaluation personnel during field evaluation will greatly increase the effectiveness of the evaluation, and a short intensive training course in human factors evaluation problems and methods is recommended for Navy personnel assigned to system evaluation. Author (TAB)

**N70-12366#** National Bureau of Standards, Washington, D.C.

**MICROBIAL CORROSION Technical Summary Report, 1 May 1968 - 30 Apr. 1969**

Warren P. Iverson and Joan Calvert 1 May 1969 40 p refs

(AD-693474; NBS-10054) Avail: CFSTI CSCL 11/6

An agar medium which will support good surface growth of marine sulfate reducers (Desulfovibrio) has been devised. Using this medium, a marine isolate of Desulfovibrio has been obtained in pure culture and used for anaerobic corrosion studies. Using polarization techniques for corrosion rate determinations, it was found that the rate of corrosion of mild steel (1020), in a culture of the same medium minus added ferrous ions, decreased to about 0.1 mdd and then increased to 7-8 mdd before termination. These changes were correlated with the formation and removal of an iron sulfide film. A non-marine strain of Desulfovibrio was found to produce a volatile organophosphorous compound which reacts with mild steel to form iron phosphide (Fe<sub>2</sub>P). It also has the ability to reduce the redox dye, benzyl viologen. The marine isolate also appears to produce this compound. Growth of the marine strain in a sea water medium containing ferrous ions to which trypticase and phytone were added resulted in formation of a black material, which upon heating to 1,204C in a vacuum oven, was found to consist of a mixture of FeS and Fe<sub>3</sub>P (schreibersite). Author (TAB)

**N70-12450#** Rochester Univ., N.Y. Dept. of Radiation and Biophysics.

**MICROWAVE STANDARDS: A COMPARATIVE ANALYSIS**

Sol M. Michaelson 23 Apr. 1969 11 p refs Presented at Ind. Neurol. Congr., Prague

(Contract W-7401-eng-49)

(UR-49-1080; CONF-690617-1) Avail: CFSTI

Factors that must be considered in quantification of the biological response to microwaves are discussed. Recommendations for developing a more rational and realistic approach to the development of standards for human exposure to microwaves are considered. The importance of including biophysical factors in relation to functional responses of the body in the development of

standards for maximum permissible exposure is pointed out. Soviet levels for maximum permissible exposures are compared with those of the United States. The importance of biomedical investigation of specific effects, engineering studies of the characteristics of the equipment, field surveys of power levels actually encountered, and development work on means of protection in establishing maximum permissible levels is pointed out. A table of recommended maximum permissible intensities for radio frequency radiation is presented.

Author (NSA)

**N70-12479#** Texas Technological Coll., Lubbock.  
**PERFORMANCE, RECOVERY AND MAN MACHINE EFFECTIVENESS** Semi-annual Progress Report, 1 Sept. 1968 28 Feb. 1969

Richard A. Dudek 15 Mar. 1969 64 p /ts Proposal No. 603  
(Contract DAAD05-69-C-0102)  
(AD-690843) Avail: CFSTI CSCL 5/5

The report describes the organization and goals of the research team with a detailed account of the experimentation that has been completed within its two basic subefforts: those of organizational and motivational emphasis and those of environmental emphasis, as they affect performance and recovery of human operations. The experimentation within organizational and motivational emphasis cover organization structure investigations, approach-avoidance conflict experimentation, the effect of dietary habits on performance and recovery, instructional ambiguity and its effects on performance, and vigilance behavior and cognition experimentation. The subteam projects within the environmental emphasis area include human performance and recovery under vibratory conditions, physical loading, ionization, and climatic conditions. The facilities and personnel are discussed and 12 papers delivered or published are listed.

Author (TAB)

**N70-12502#** Joint Publications Research Service, Washington, D.C.

**NEW MEASUREMENT TECHNIQUES IN STUDYING THE EFFECT OF SUPERHIGH FREQUENCY FIELDS IN BIOLOGICAL SUBJECTS**

V. M. Kolesnikov 12 Nov. 1969 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (Leningrad), v. 12, no. 7, 1969 p 9-12  
(JPRS-49239) Avail: CFSTI

Dielectric waveguides are proposed for millimeter range studies using hornradiators. By means of these waveguides, the electromagnetic energy was fed to the structures in an open form and under the protection to the upper layers. The operating conditions of the dielectric waveguides under various biological loads were determined.

Author

**N70-12540#** Computer Corp. of America, Cambridge, Mass.  
**CYCLOPS-3 SYSTEM RESEARCH** Final Report, 9 Feb. 1966 31 Jan. 1969

Thomas Marill, Kurt Franck, and Elisabeth Turner Mar. 1969 83 p refs  
(Contract AF 19(628)-5914)  
(AD-693204; AFCRL-69-0323) Avail: CFSTI CSCL 9/2

The aim of the Cyclops project research is the development of techniques for allowing computers to perform visual scene analysis, pre-processing of visual imagery, and perceptual learning. Work on scene analysis and learning has previously been described. The present report deals with research on pre-processing and with further work on scene analysis. The principal pre-processing tool is the local operation. The theory of linear local operations is discussed. A programming system, L-OPS, suitable for

experimentation with linear and non-linear local operations is described, as well as the use of L-OPS as a pre-processor for certain classes of pictures.

Author (TAB)

**N70-12579#** Akademiya Nauk URSR, Kiev.  
**HUMAN PERCEPTION OF BIOMETEOROLOGICAL PARAMETERS**

K. S. Voychishin and V. N. Mikhajlovskiy In its Methods for Collecting and Process. Inform. 1967 p 29-33 refs In RUSSIAN (See N70-12576 02-34)  
Avail: CFSTI

The feasibility of using pain feelings in patients suffering from rheumatism as indicators of precipitation was investigated, as well as whether daily drops in atmospheric pressure, temperature, or moisture content may serve as transmitters of biometeorological forecast data. Feelings of pain in the heart or joints experienced by 20 rheumatic children between the ages of 8 and 15 were recorded over a four month period. Results were correlated with precipitation measurements from 10 meteorological stations. Correlation values are depicted using graphs. Changes in atmospheric pressure, temperature, and moisture were not found to be valid carriers of biometeorological data.

Transl. by E.C.

**N70-12612\*#** National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Tex.

**BIOLOGICAL ISOLATION GARMENT Patent Application**

Fred R. Spross, inventor (to NASA) Filed 9 Sep. 1969 11 p  
(NASA-Case-MSC-12206-1; US-Patent-Appl-SN-856258) Avail: CFSTI CSCL 06K

The instant invention is directed to a garment for containing biological life forms which may be present on the body of an astronaut returning from the surface of an extra terrestrial body such as the moon. The suit is a completely enclosable, one-piece garment fabricated primarily from a tightly woven, permeable cotton fabric to permit body ventilation while maintaining the required biological containment. All fabrication seams are internally sealed and medical rubber gloves are sealed to the ends of the arms. The novelty of the invention appears to reside in the use of a permeable material in constructing the suit with provision for filtering both inspired and expired breath and the design of the zipper closure which permits rapid sealing and ease in donning and removal of the suit.

NASA

**N70-12622\*#** National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Tex.

**EXTRAVEHICULAR TUNNEL SUIT SYSTEM Patent Application**

Joseph J. Kosmo, inventor (to NASA) and Elton M. Tucker, inventor (to NASA) Filed 12 Sep. 1969  
(NASA-Case-MSC-12243-1; US-Patent-Appl-SN-857445) Avail: CFSTI CSCL 06K

An extravehicular human work station permitting manual operation in a hostile environment is projected. The work station consists of a semi-anthropomorphic assembly attached to the distal end of a tunnel extending from a vehicle wall. The tunnel is of convoluted bellows construction and may be selectively axially expanded or contracted by a system of individually controlled cables. The cables may be operated individually also in order to regulate the angle from which the tunnel axis projects from the vehicle wall.

NASA

**N70-12639#** California Univ., Livermore. Lawrence Radiation Lab. Bio-Medical Div.

**THE CHROMOSOME SCANNING PROGRAM AT THE LAWRENCE RADIATION LABORATORY**

Stuart P. Stone, James L. Littlepage, and Bruce R. Clegg 14 May

1969 27 p refs Presented at Pattern Recognition Studies Seminar, New York, 9 - 10 Jun. 1969 Submitted for publication Sponsored by AEC  
(UCRL-71493; CONF-690616-1; Rept-2) Avail: CFSTI

During the past two years, the LRL Chromosome Group has developed a production-line system for its low-dose radiation studies using a FIDAC film reader and a collection of pattern-recognition, data-handling, and statistical programs. Changes in the LRL computer facilities require the conversion of all computer programs and the attachment of our image-processing equipment to a large time-shared computer, a CDC-6600. Author (NSA)

**N70-12654#** Joint Publications Research Service, Washington, D.C.

**ON THE COURSE TO AN ARTIFICIAL BRAIN**

I. P. Litnitskiy 17 Nov. 1969 64 p Transl. into ENGLISH from the book 'Besedy O Bionike' Moscow, 1968 p 521 - 592 (JPRS-49263) Avail: CFSTI

A discussion is presented on the functions of the brain, electronic models of the brain, and the use of computers in scientific research and manufacturing, and in various aspects of the national economy. Experiments on memory of animals and man are reviewed, and the role of the neuron is described. Models of the brain are divided into two groups: those which try to create models of nerve cells that reproduce biological functions, and those which try to create models capable of performing flexible logical functions of a neuron. Artrons, neuristors, magnetic integrating neuron devices, and memistors are described. A few of the future uses of computers are identified as weather prediction, automatic flight control for unmanned space vehicles, operations research, and operating equipment under dangerous conditions. The advantages accruing from micromodule development are also emphasized. N.E.N.

**N70-12664\*#** Avco Corp., Lowell, Mass. Applied Technology Div.  
**CONTINUATION OF THE DEVELOPMENT OF A TYPICAL MARS LANDING CAPSULE STERILIZATION CONTAINER**  
**Research and Technology Implications Report**  
16 May 1969 28 p  
(Contract NAS8-20682)  
(NASA-CR-102353; AVATD-0081-69-CR) Avail: CFSTI CSCL 06M

Five tasks received major emphasis: (1) the selection of tracer organism, carrier material, surface finish, and spore population for ultrahigh vacuum, ambient control, and ultraviolet exposures, and population survival studies lasting up to eight months; (2) the evaluation of the possible recontamination hazard during space flight and deployment maneuvers including organism survival, conditions for organism release and particle movement in the interplanetary spacecraft environment; (3) laboratory investigations of release mechanisms and spore particle charge characteristics; (4) the development, fabrication, and testing of separation joints, dispersion devices, and witness methods to simulate the release of organism from the unsterile outer surface of the flight hardware; and (5) the development of a probabilistic recontamination model and recommendation for ground test certification. It is concluded that *Bacillus globigii* bacterial spores are ideal test organisms for long-term sterility certification procedures, that large numbers of microbes are likely to survive the environmental profiles of launch and space flight and present recontamination hazards during the lander deployment phase, and that dry *B. globigii* spores can be treated as nonconducting spheres. M.H.E.

**N70-12671#** Joint Publications Research Service, Washington, D.C.

**CYBERNETICS AND TECHNICAL PROGRESS**

V. M. Glushkov 1 Dec. 1969 24 p Transl. into ENGLISH from

Radyanska Ukr. (Kiev), 16 Sep. 1969 p 3 - 4  
(JPRS-49352) Avail: CFSTI

Cybernetics technology and applications are surveyed. Applications cited include automated production, data processing, economic and management planning, automatic control, and education. J.A.M.

**N70-12679#** California Univ., San Francisco. Lab. of Radiobiology.

**ENDOGENOUS NON-PROTEIN SULFHYDRYL AND CELLULAR RADIOSENSITIVITY**

J. W. Harris May 1969 14 p refs Presented at 2nd Intern. Symp. on Radiosensitizing and Radioprotective Drugs, Rome (Contract AT(11-1)-GEN-10)  
(UCSF-10-P-2-75; CONF-690525-1) Avail: CFSTI

Ehrlich ascites tumor cells in vivo and HeLa cells in vitro increased their intracellular nonprotein SH (NPSH) concentration as they moved into and through S phase of cell cycle. Although increasing NPSH coincided with a period of increasing radioresistance, other evidence suggested that the relation may not be a causal one. Chinese hamster cells in plateau growth contained only one-third the NPSH concentration of exponentially growing cells, yet the two were equally sensitive (same D sub 0) to a single dose of X rays. Ehrlich ascites tumor cells treated with methyl phenyldiazene carboxylate (a specific NPSH oxidant under the conditions employed) were not significantly more radiosensitive than untreated cells, although they contained only 20 to 30% of their normal NPSH complement when irradiated. It was concluded that although endogenous NPSH did fluctuate as cells move around the cell cycle, these fluctuations were probably not the cause of age-dependent radiosensitivity. Author (NSA)

**N70-12689#** President's Science Advisory Committee, Washington, D.C. Space Science and Technology Panel.

**THE BIOMEDICAL FOUNDATIONS OF MANNED SPACE FLIGHT**

Nov. 1969 35 p  
Avail: SOD \$0.45

Ways of optimizing manned space program planning to ensure maximum benefits in the fields of environmental medicine and bioengineering were investigated. Human resource requirements both within NASA and the scientific community were considered. Recommendations are given, emphasizing biomedical applications for post-Apollo manned space flight program planning. The following program priorities are highlighted: biomedical research goals, research facilities, international cooperation, cooperation with academic and industrial centers, organizational structure realignments, and budgetary allocations. E. C.

**N70-12702#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Braunschweig (West Germany). Inst fuer Flugfuehrung.

**A METHOD FOR THE DIGITAL RECORDING AND ON-LINE PROCESSING OF PULSE AND RESPIRATION RATE [EIN VERFAHREN ZUR DIGITALEN AUFNAHME UND ON-LINE VERARBEITUNG VON PULS- UND ATEMFREQENZ]**

Hans-Dieter Schenk, Ernst Kohnen, and Eckhart Zietlow May 1969 37 p refs In GERMAN; ENGLISH summary  
(DLR-MITT-69-08) Avail: CFSTI

The application of physiological measurements to human factors engineering requires measuring devices available in the field of medicine. The integration of these devices into an existing technical test facility, however, raises some problems. Using pulse and respiration rate measurements for demonstration, a data acquisition and data storage system has been studied using the digital computer available in modern test facilities for human factors engineering research. A description of the sensors used and a listing of an appropriate program for the DEC-PDP8 computer is also given. Author (ESRO)

## IAA ENTRIES

## A70-10030

## RADIATION BIOCHEMISTRY (STRAHLEN-BIOCHEMIE).

C. Streffer (Freiburg, Universität, Radiologisches Institut, Freiburg im Breisgau, West Germany).

Berlin, Springer-Verlag (Heidelberger Taschenbücher. Volume 59/60), 1969. 207 p. 277 refs. In German. \$3.70.

The present state of knowledge concerning the biochemical effects of radiation is reviewed. Fundamental aspects of the effect of radiation on biological tissue are examined. Changes in nucleic acids after radiation are discussed. Radiation-induced changes in proteins and effects on the metabolism are explored. The metabolism of carbohydrates after radiation is investigated. The effects of radiation on lipids, hormones, and vitamins are considered, and the formation of toxic substances is discussed. Functional changes induced in a living cell by radiation are examined.

G.R.

## A70-10035 \*

## RESPONSE OF MONKEY BIORHYTHMS TO CHANGING PHOTO-PERIODS.

C. M. Winget, C. W. DeRoshia, and N. W. Hetherington (NASA, Ames Research Center, Environmental Biology Div., Moffett Field, Calif.).

*Comparative Biochemistry and Physiology*, vol. 30, no. 4, 1969, p. 621-630. 14 refs.

Description of changes in deep body temperature (DBT) and locomotor activity (LMA) phase relationships, and of changes in the DBT waveform in the ambulatory primate *Cebus albifrons* in response to changing photoperiods. It is suggested that not only do DBT and LMA appear to be coupled oscillators, but that the DBT cycle itself may be composed of coupled physiological oscillators.

M.M.

## A70-10036

## INTENSIVE TREATMENT OF AILMENTS RESULTING FROM A DECREASE IN PRESSURE (INTENSIV-BEHANDLUNG BEI DRUCKFALLKRANKHEITEN).

O. Wünsche.

IN: DEUTSCHE GESELLSCHAFT FÜR UNFALLHEILKUNDE VERSICHERUNGS-, VERSORGUNGS- UND VERKEHRSMEDIZIN, MEETING, 32ND, HAMBURG, WEST GERMANY, MAY 27-29, 1968, PROCEEDINGS (DEUTSCHE GESELLSCHAFT FÜR UNFALLHEILKUNDE VERSICHERUNGS-, VERSORGUNGS- UND VERKEHRSMEDIZIN, TAGUNG, 32ND, HAMBURG, WEST GERMANY, MAY 27-29, 1968, VERHANDLUNGEN).

Berlin, Springer-Verlag (Hefte zur Unfallheilkunde, No. 99), 1969, p. 73-78. In German.

(DVL-894)

Discussion of the clinical treatment of ailments and symptoms produced by exposure to changes in environmental air pressure. These changes include the case of a drop from a higher pressure to atmospheric pressure and the case of a change from atmospheric pressure to a lower pressure. Biophysical changes and symptoms

produced are examined, and suitable methods of treatment are discussed. The application of a pressure of more than 2 atm is recommended as a treatment for cases with neurological symptoms caused by exposure to a low pressure if a pressure chamber is available. In case of complaints due to exposure to a high pressure a recompression treatment is considered.

G.R.

## A70-10051 #

## FUNCTIONAL INTERRELATIONS BETWEEN THE CORTEX AND THE HYPOTHALAMUS AND THE FORMATIO RETICULARIS OF THE BRAIN STEM (FUNKSIONAL'NYE VZAIMOOTNOSHENIYA KORY GOLOVNOGO MOZGA S GIPOTALAMUSOM I RETIKULIARNOI FORMATSIEI STVOLA MOZGA).

V. O. Al'ber (Akademiia Meditsinskikh Nauk SSSR, Institut Normal'noi i Patologicheskoi Fiziologii, Laboratoriia Obshchei Fiziologii Tsentral'noi Nervnoi Sistemy, Moscow, USSR).

*Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 68, Aug. 1969, p. 3-6. 10 refs. In Russian.

Investigation of the influence of corticofugal effects on the functional relations between the hypothalamus and the formatio reticularis in a total of 42 anesthetized cats. The sensorimotor cortex of the cats is cooled, or KCl and strychnine solutions are applied to it during the experiments. It is found that both blocking and stimulation of the cortical elements have distinct specific effects on the functional relations between the hypothalamus and the formatio reticularis.

V.Z.

## A70-10052 #

## TEMPERATURE ANALYSIS OF THE PROPERTIES OF THE HEART (TEMPERATURNYI ANALIZ SVOISTV SERDTSYA).

V. M. Pokrovskii (Kubanskii Meditsinskii Institut, Kafedra Normal'noi Fiziologii, Krasnodar, USSR).

*Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 68, Aug. 1969, p. 9-11. 13 refs. In Russian.

Determination of the temperature coefficient ( $Q_{10}$ ) for various characteristics of cardiac activity in a total of 24 experiments on dogs. Numerical values are given for the  $Q_{10}$  of various cardiac functions of the experimental dogs. Cardiac functions of physical and chemical nature are specified.

V.Z.

## A70-10053 #

## INFLUENCE OF VARIOUS CORTICAL REGIONS ON THE NEURON ACTIVITY IN THE LATERAL PORTIONS OF THE HYPOTHALAMUS POSTERIOR (VLIYANIE RAZLICHNYKH OBLASTEI KORY MOZGA NA AKTIVNOST' NEIRONOV LATERAL'NYKH OTDELOV ZADNEGO GIPOTALAMUSA).

V. G. Zilov (I Moskovskii Meditsinskii Institut, Kafedra Normal'noi Fiziologii, Moscow, USSR).

*Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 68, Aug. 1969, p. 21-23. 13 refs. In Russian.

Study of the intraneuron activity in the lateral portions of the hypothalamus posterior of anesthetized cats during stimulation of various cortical regions by bipolar electrodes with an interelectrode gap of 2 mm. It is found that the neurons of the hypothalamus posterior have a low level of spontaneous activity and are highly capable of converging various cortical stimuli.

V.Z.

## A70-10054 #

INFLUENCE OF ADRENALECTOMY ON THE INTENSITY OF PHOSPHOLIPID METABOLISM IN THE BRAIN OF RATS DURING HYPOXIA (VLIIVANIE ADRENALEKTOMII NA INTENSIVNOST' OBMENA FOSFOLIPIDOV MOZGA KRYSPRI GIPOKSII).

L. M. Antonov and S. V. Gasteva (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR).

*Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 68, Aug. 1969,

p. 28-31, 6 refs. In Russian.

Study of the rates of incorporation of radioactive phosphate into various types of phospholipids in the cerebrum of pseudo-operated and adrenalectomized rats under conditions of hypoxia. Phospholipid metabolism is found to be more suppressed in the cerebrum of adrenalectomized rats than in the cerebrum of pseudo-operated rats.

V.Z.

## A70-10055 #

CONTENT OF CERTAIN CARBOHYDRATE-PHOSPHORUS METABOLITES IN THE BRAINS OF GOPHERS OF DIFFERENT AGES UNDER NORMAL CONDITIONS AND DURING HYPOTHERMIA AND SPONTANEOUS WARMING (SODERZHANIE NEKOTORYKH UGLEVODNO-FOSFORNYKH METABOLITOV V MOZGU SUSLIKOV RAZLICHNYKH VOZRASTOV V NORME, PRI GIPOTERMII I SAMOSOGREVANII).

S. P. L'vova (Dagestanskii Gosudarstvennyi Universitet, Makhachkala, USSR).

*Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 68, Aug. 1969, p. 63, 64, 6 refs. In Russian.

Determination of the content of inorganic phosphorus, creatine phosphate, ATP, ADP, glucose, and lactic acid in the brain of *Citellus pygmaeus* Pall. of different ages. The animals were cooled to a rectal temperature of 10 deg C and allowed to regain their normal temperature at room temperature. The content of macroergic phosphates is known to be higher in the brains of month-old gophers than in those of pubescent and sexually mature animals. It is found that hypothermia levels out the age differences in the amount of macroergic phosphates in the brains of these animals.

V.Z.

## A70-10056 #

METHOD OF REVERSIBLE COLD-INDUCED DEACTIVATION OF THE NEOCORTEX IN A CHRONIC EXPERIMENT (METOD OBRATIMOGO KHOLODOVOGO VYKLIUCHENIIA NEOKORTEKSA V KHRONICHESKOM EKSPERIMENTE).

N. Iu. Belenkov, V. A. Sosonkov, V. N. Sapozhnikov, and V. I. Shcherbakov (Gor'kovskii Meditsinskii Institut, Kafedra Normal'noi Fiziologii, Laboratoriia Neirofiziologii, Gorki, USSR).

*Biulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 68, Aug. 1969, p. 121-123, 7 refs. In Russian.

Description of an experimental technique for reversibly deactivating the bioelectric activity of the neocortex of animals by cooling. The temperature can be decreased down to 20 deg C in portions of the cortex when a specially designed cooling system is attached to the head of the animal. The technique is applied to cats undergoing chronic experiments.

V.Z.

## A70-10091 \*

PHOSPHOPENTOMUTASES. I—IDENTIFICATION OF TWO ACTIVITIES IN RABBIT TISSUES.

Harold O. Kammen and Rose Koo (California, University, Space Sciences Laboratory, Berkeley, Calif.).

*Journal of Biological Chemistry*, vol. 244, Sept. 25, 1969, p. 4888-4893, 25 refs.

NIH Grant No. AM-11823; Grant No. NGR-05-003-020.

Crystalline rabbit muscle phosphoglucomutase (PG-mutase) was found to possess a low intrinsic activity for pentose phosphates. This activity was associated with each of the molecular forms of the enzyme protein. The distribution of phosphopentomutase activity in rabbit tissues did not parallel the distribution of PG-mutase activity, but was tissue-specific, thus suggesting the occurrence of additional types of phosphopentomutase. Two distinct phosphopentomutase activities were resolved by chromatography of tissue extracts on diethylaminoethyl cellulose at pH 7.0. These differed in catalytic properties and in molecular size. One of the phosphopentomutase activities (Peak A) was probably a subsidiary function of PG-mutase protein. The other phosphopentomutase (Peak B) was much more active with pentose phosphates than with glucose phosphates, and represented a previously unrecognized enzyme, distinct from PG-mutase. Peak B phosphopentomutase was the predominant type found in most rabbit tissues, but was almost totally absent from muscle.

(Author)

## A70-10124 #

ANALYSIS OF THE ELECTRICAL REACTIONS OF CEREBELLAR NEURONS OF CATS IN RESPONSE TO ADEQUATE STIMULATION OF THE VESTIBULAR APPARATUS (ANALIZ ELEKTRICHESKIKH REAKTSII NEIRONOV MOZZHECHKA KOSHEK V OTVET NA ADEKVATNOE RAZDRAZHENIE VESTIBULIARNOGO APPARATA).

M. D. Venttsel', O. G. Gazenko, R. A. Grigor'ian, and E. M. Kristi (Akademiia Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR).

*Akademiia Nauk SSSR, Izvestiia, Serii Biologicheskaja*, July-Aug. 1969, p. 545-559, 36 refs. In Russian.

Microelectrophysiological study of the responses of individual cerebellar neurons to stimulation of the vestibular apparatus by vertical rocking at 0.8 to 1.2 g carried out on a total of 93 mildly anesthetized adult cats. The following types of responses are established for individual neurons of different groups: (1) a direct correlation with the rocking periods, (2) increased pulsed activity, (3) decreased pulse frequency, (4) changes in pulse phases, and (5) the absence of an apparent reaction. Autocorrelational analysis of the results leads to the conclusion that the cellular elements of certain cortical regions and cerebellar nuclei participated in the coordination of postural reflexes of the cats.

V.Z.

## A70-10125 #

ANALYSIS OF ARTERIAL PULSATIONS UNDER TRANSVERSE ACCELERATIONS (ANALIZ ARTERIAL'NOI PUL'SATSII PRI POPERECHNYKH USKORENIIM).

Iu. E. Moskalenko, G. B. Vainshtein, and T. P. Filanovskaia (Akademiia Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR).

*Akademiia Nauk SSSR, Izvestiia, Serii Biologicheskaja*, July-Aug. 1969, p. 560-566, 30 refs. In Russian.

Application of the results of a mathematical analysis of arterial-pressure pulse waves to a study of the variations in the stroke volume in a group of ten anesthetized dogs subjected to spine-to-breast accelerations of 6, 10, and 20 g. It is found that under these accelerations, the expiration stroke volume decreased from the inspiration stroke volume by 35, 48, and 57 per cent, respectively, while this difference ranged between 10 and 20 per cent under normal conditions. The changes in arterial pulsation modes under acceleration are determined by Fourier analysis.

V.Z.

A70-10127 \*

**THE DETECTION OF BACTERIA AND VIRUSES IN LIQUIDS.**

M. A. Mitz (NASA, Washington, D.C.).

*New York Academy of Sciences, Annals*, vol. 158, June 20, 1969, p. 651-664. 9 refs.

Discussion of a series of specific bacterial and viral measuring techniques with emphasis on potential applications to industrial processing. These techniques are based on the general concept of measuring a specific property relevant to the biological particle. The comparative values of the detection techniques discussed are tabulated. The information derived from each method is limited and must be coupled with the critical specific information needed for a particular problem of biological particle counting. In general, narrowing the problem in this manner makes it possible to study situations which would be otherwise impossible to monitor using standard techniques. It is pointed out that continuous automated monitoring for bacteria and viruses in fluid production lines in real time is a possibility for the near future, with a high potential for economic reward.

M.M.

A70-10137 #

**EFFECT OF LOCAL GAMMA IRRADIATION ON THE NUMBER OF CHROMOSOME ABERRATIONS IN THE LYMPHOCYTES OF HUMAN PERIPHERAL BLOOD (VLIIVANIE MESTNOGO GAMMA-OBLUCHENIIA NA KOLICHESTVO KHROMOSOMNYKH ABERRATSII V LIMFOTSITAKH PERIFERICHESKOI KROVI CHELOVEKA).**

L. B. Berlin (Voenno-Meditsinskaya Akademiya, Leningrad, USSR).

*Akademiya Nauk SSSR, Doklady*, vol. 187, July 11, 1969, p. 446-448. 12 refs. In Russian.

Investigation of chromosome aberrations in groups of oncological patients subjected to local gamma irradiation after hysterectomy. No statistically proven differences are established between chromatide aberrations in irradiated and control patients. The results for chromosome aberrations after irradiation generally agree with observations by Fisher et al. (1966), Norman (1967), and Buckton et al. (1967). Further studies are suggested.

V.Z.

A70-10233 #

**EXPERIMENTAL RESEARCH ON HUMANS IN A STATE OF HYPOTHERMIA RESULTING FROM BEING CONFINED TO A LIFE RAFT ON THE OPEN SEA (RICERCHE SPERIMENTALI SULL'UOMO IN IPOTERMIA, DA PERMANENZA SU MEZZI DI SALVATAGGIO IN MARE).**

P. Rota (Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome, Italy).

*Rivista di Medicina Aeronautica e Spaziale*, vol. 32, Apr.-June 1969, p. 215-230. 12 refs. In Italian.

Study of the variation of certain physiological data (tympanic and surface temperatures, heart rate, and oxygen intake) in subjects wearing water-soaked flight suits in a low-temperature, high-ventilation environment. On the basis of both recorded and calculated physiological data, such as mean body temperature and thermal balance, thermal conditions and thermoregulatory responses are studied. Some considerations regarding the importance of these conditions for survival are presented.

O.H.

A70-10234 #

**EXPERIMENTAL CONTRIBUTION TO THERAPEUTIC AND PREVENTIVE TREATMENT OF FLIGHT FATIGUE (CONTRIBUTO SPERIMENTALE AL TRATTAMENTO TERAPEUTICO E PREVENTIVO DELLA FATICA DEL PILOTAGGIO).**

G. Rotondo (Istituto Medico Legale AM, Milan, Italy).

*Rivista di Medicina Aeronautica e Spaziale*, vol. 32, Apr.-June 1969, p. 231-268. 45 refs. In Italian.

Investigation of the flight fatigue syndrome, its origin, therapy, and prevention, carried out in the light of modern concepts of its etiopathogenesis. A general review and definition of the flight fatigue syndrome, its pathogenesis, diagnosis, symptomatology, and traditional therapy are presented. The results of experimental research and investigations carried out to test the possible effectiveness of some cortical adrenal hormones in preventive and therapeutic treatment of this syndrome are reported, and, for each substance studied, the possible physiopharmacological mechanisms of its effect on fatigue therapy and prevention are surveyed. The favorable results obtained with some drugs, mainly with dehydroisoandrosterone and with a mixture of acetyl aspartic acid and citrulline, are demonstrated.

O.H.

A70-10235 #

**CLINICAL CONTRIBUTION TO THE PROBLEM OF FLIGHT PHOBIA (CONTRIBUTO CLINICO AL PROBLEMA DELLE Fobie DA VOLO).**

L. Longo.

*Rivista di Medicina Aeronautica e Spaziale*, vol. 32, Apr.-June 1969, p. 269-280. 8 refs. In Italian.

Discussion of the cliniconosographic criteria of flight phobia and of the elements which differentiate them from other psychopathologic syndromes. Following the definition of flight phobia, three actual cases observed are described. These cases are commented on, and the importance of sociofamilial and operative factors is stressed in the genesis of these clinical manifestations, as stated by other authors. Finally, considerations regarding the prognostic evaluation are presented.

O.H.

A70-10236 #

**CONSIDERATIONS REGARDING THE IMPORTANCE OF ADSORPTION PHENOMENA IN RELATION TO THE PURITY OF OXYGEN IN THE GASEOUS STATE (CONSIDERAZIONI IN MERITO ALL'IMPORTANZA DEI FENOMENI DI ADSORBIMENTO IN RELAZIONE ALLA PUREZZA DELL'OSSIGENO ALLO STATO GASSOSO).**

C. Marangoni and A. Tronca (Ministero della Difesa, Direzione Laboratori AM, Rome, Italy).

*Rivista di Medicina Aeronautica e Spaziale*, vol. 32, Apr.-June 1969, p. 281-295. 13 refs. In Italian.

Discussion of both chemical and physical adsorption of gaseous oxygen contaminants with the aim of maintaining oxygen purity for respiratory purposes. It is shown that only trichloroethylene and carbon tetrachloride, among liquid oxygen contaminants, are adsorbed and sometimes given back by the container walls. This phenomenon, which does not apply to other commonly present contaminants, is regarded as very important from the hygienic and analytical standpoints.

O.H.

A70-10237 #

**METHOD OF DETERMINATION OF THE VOLATILE CONTAMINANTS EMITTED FROM THE MATERIALS EMPLOYED FOR SPACE CABIN CONSTRUCTION (METODO DI DETERMINAZIONE DEI CONTAMINANTI VOLATILI EMESSI DAI MATERIALI IMPIEGATI PER LA COSTRUZIONE DELLE CABINE SPAZIALI).**

Pustinger and Hodgson.

*Rivista di Medicina Aeronautica e Spaziale*, vol. 32, Apr.-June 1969, p. 297, 298. In Italian.

Examination of 53 different commercial structural materials

used for space cabin construction in order to determine the volatile contaminants liberated from these materials under space conditions. A method of testing these materials under simulated space conditions is described in detail. The test procedure proved to be successful, resulting in the liberation of a number of volatile contaminants which were subjected to final analysis. O.H.

## A70-10269

**CHARACTER, CAUSE, AND CONSEQUENCE OF COMBINED LEFT AXIS DEVIATION AND RIGHT BUNDLE BRANCH BLOCK IN HUMAN ELECTROCARDIOGRAMS.**

Thomas B. Watt, Jr. (Baylor University, College of Medicine, Dept. of Medicine, Houston, Tex.) and Raymond D. Pruitt (Mayo Graduate School of Medicine, Rochester, Minn.).  
*American Heart Journal*, vol. 77, Apr. 1969, p. 460-465. 7 refs.  
 PHS Grants No. HE-05435; No. HE-10400.

Discussion of specific electrocardiographic features and clinical findings in a series of patients who had left axis deviation combined with right bundle branch block. It was found that experimentally induced left anterior fascicular block, when combined with right bundle branch block, produced electrocardiographic changes of left axis deviation and right bundle branch block in both canine and primate hearts. Clinically, a similar combination of electrocardiographic changes was encountered in approximately 1 per cent of patients on whom tracings were taken for any purpose whatsoever. Among 65 patients having such electrocardiographic changes, Q waves revealed anterior myocardial scarring in 13, posterior myocardial scarring in 12, and combined anterior and posterior scarring in three. G.R.

## A70-10270

**COMPUTED ST FORCES OF FRANK AND BIPOLAR EXERCISE ELECTROCARDIOGRAMS.**

Tom R. Hornsten (U.S. Public Health Service, National Center for Chronic Disease Control, Washington, D.C.) and Robert A. Bruce (Washington, University, Dept. of Medicine, Seattle, Wash.).  
*American Heart Journal*, vol. 78, Sept. 1969, p. 346-357. 13 refs.  
 PHS Grant No. CD-00066.

Computer analysis and comparison of several portions of the ST segment recorded on the Frank lead electrocardiogram, along with the bipolar lead previously used in ambulatory individuals exhibiting both normal and abnormal responses to maximal exercise. Thirty-nine multistage maximal exercise tolerance tests were conducted on 36 individuals. The groups consisted of healthy persons and cardiac patients. Each subject walked until exhaustion on a motor-driven treadmill as speed and grade increased at three-minute intervals. During these exercises, simultaneous  $CB_s$ , bipolar and Frank X, Y, and Z orthogonal ECG leads were recorded. It is found that the ST vectors move rightward, superiorly, and posteriorly during exercise. Immediately after exercise, they revert to an anterior location. Z.W.

## A70-10271

**ATRIAL FLUTTER SOUNDS—REPORT OF A CASE.**

Alberto Dolara and Brunello Tordini (Arcispedale di S. M. Nuova, Florence, Italy).  
*American Heart Journal*, vol. 78, Sept. 1969, p. 369-372. 13 refs.

Description of a case involving mitral stenosis and atrial flutter, in which atrial sounds were heard and recorded. The atrial sounds heard were high-pitched, and phonocardiographic analysis by passband filters showed both low- and high-frequency components. The mechanisms generating such sounds are discussed. Z.W.

## A70-10272

**SERIAL P WAVE CHANGES IN ACUTE MYOCARDIAL INFARCTION.**

James I. Grossman and Abner J. Delman (Montefiore Hospital and Medical Center, Bronx, N.Y.).

*American Heart Journal*, vol. 77, Mar. 1969, p. 336-341. 26 refs.

Description of P-wave changes observed in serial ECGs in patients with acute myocardial infarction. Tall, peaked P waves of normal duration were recorded in lead 2 of the ECG in 24 patients during the course of acute myocardial infarction and were observed to be transient in 21 of these. No patient had evidence of valvular heart disease, pulmonary emboli, or other pulmonary pathology. Fourteen patients had manifestations of left-sided congestive heart failure during the time of greatest P-wave abnormality. Twelve patients had concomitant abnormal posterior rotation of the P-wave vector, indicative of left atrial overloading. The possible factors in the genesis of these P-wave alterations are discussed. The pattern of P pulmonale may occur during the course of an acute myocardial infarction in the absence of demonstrable pulmonary emboli or other pulmonary pathology. F.R.L.

## A70-10273

**CORONARY ARTERY DISEASE AND MAJOR CONDUCTION DISTURBANCES—A PATHOLOGIC STUDY DESIGNED TO CORRELATE VASCULAR AND CONDUCTION SYSTEM ABNORMALITIES WITH ELECTROCARDIOGRAM.**

Donald B. Hackel, E. Harvey Estes, Jr. (Duke University, Medical Center, Durham, N.C.), James R. Harper, and Alexander Harley.

*American Heart Journal*, vol. 77, Mar. 1969, p. 411-422. 31 refs.

Research supported by the American Medical Association; NIH Grants No. PH-43-67-1440; No. HE-05875.

Description of a technique for correlating vascular anatomy with conduction tissue structures in the human heart. This technique was used to study eight selected cases of coronary artery disease who demonstrated major conduction disturbances by ECG. It was concluded that there is a good correlation between histologic changes in the major pathways of the conduction system and demonstrable electrocardiographic abnormalities. There is poor correlation between specific vascular pathology and histologic changes in the major conduction pathways, except when related to fresh vascular occlusive disease. The development of collateral circulation in the upper interventricular septum is the one anatomic feature which appears to govern the relationship between vascular and conduction tissue pathology. The broad spectrum of pathologic processes in coronary artery disease associated with major conduction disturbances is felt to account for the marked variability in the clinical setting and the course of these cases. F.R.L.

## A70-10274

**USE OF ORAL POTASSIUM SALTS IN THE ASSESSMENT OF T-WAVE ABNORMALITIES IN THE ELECTROCARDIOGRAM—A CLINICAL TEST.**

Robert G. Schneider (Montefiore Hospital, Bronx, N.Y.) and Alan F. Lyon (Brookdale Medical Center, Brooklyn, N.Y.).

*American Heart Journal*, vol. 77, June 1969, p. 721-731. 43 refs.

Assessment of the usefulness and toxicity of a 10-gram oral dose of potassium chloride in the evaluation of nonspecific T-wave abnormalities in the EKG. The oral administration of 10 grams of potassium chloride in a single dose has been found to restore repolarization toward normal in a series of patients without organic heart disease, but has little or no effect on T abnormality in patients with organic heart disease. The test has been shown to be safe in the patients for whom it would be useful, but potentially dangerous in patients with documented heart disease. In addition, the dose and mode of administration are critical to the result. M.M.



#### A70-10275 FREQUENCY CHARACTERISTICS OF SOME PRESSURE TRANSDUCER SYSTEMS.

James A. Cronvich and George E. Burch (Tulane University, New Orleans, La.).

*American Heart Journal*, vol. 77, June 1969, p. 792-797.

Research supported by the Rudolph Matas Memorial Fund and the Rowell A. Billups Fund for Research in Heart Disease; PHS Grant No. HE-06769.

Investigation of various air-filled, water-filled, and blood-filled pressure transducer systems using different sizes of needles and connecting tubing. Using the frequency characteristic as a criterion, it is shown that, for optimal reproduction of the human pulse wave, air-filled systems are best. However, where liquid filling is necessary, water- (or saline-) filled systems are to be preferred to blood-filled systems. M.M.

#### A70-10276 IMMUNOLOGIC FINDINGS IN IDIOPATHIC CARDIOMYOPATHY.

Evelyn V. Hess, Noble O. Fowler (Cincinnati, University, College of Medicine; Cincinnati General Hospital, Cincinnati, Ohio), Gene Conway (Cincinnati, University, College of Medicine; Veterans Administration Hospital, Cardiology Section, Cincinnati, Ohio), and T. Frank Camp.

*American Heart Journal*, vol. 77, May 1969, p. 610-618. 57 refs.

PHS Grants No. HE-6307; No. HE-5445.

Evaluation of serologic evidence of possible immune mechanisms including heart muscle antibodies in 33 patients with idiopathic cardiomyopathy. The results obtained fail to show evidence of autoimmune disease in the majority of the patients with idiopathic cardiomyopathy, and do not support the concept that immune mechanisms are responsible for this disease in the majority of instances. M.M.

#### A70-10277 THE DIAGNOSTIC VALUE OF THE ATRIAL GALLOP IN ACUTE MYOCARDIAL INFARCTION.

John C. Hill, Robert A. O'Rourke, Richard P. Lewis, and George M. McGranahan (Madigan General Hospital, Dept. of Medicine, Tacoma, Wash.).

*American Heart Journal*, vol. 78, Aug. 1969, p. 194-201. 30 refs.

Determination of the incidence of atrial and ventricular gallops during acute infarction by serial auscultation and phonocardiograms. Attention is given to the diagnostic value of the atrial gallop in separating patients with myocardial infarction from those with chest pain of other etiology. It is concluded from the investigations that almost all patients with acute myocardial infarction have an atrial diastolic gallop, and that the absence of this sound in a patient with chest pain and in sinus rhythm makes the diagnosis of acute infarction less likely. In addition, the presence of an atrial gallop does not help to identify cardiac patients with and without infarction, but it may distinguish these two groups from noncardiac patients with chest pain in a similar age group. G.R.

#### A70-10351 LIGHT AND ELECTRON MICROSCOPICAL STUDY OF THE RELATIONSHIPS BETWEEN THE CEREBELLUM AND THE VESTIBULAR ORGAN OF THE FROG.

D. E. Hillman (AMA/ERF, Institute for Biomedical Research, Chicago, Ill.).

*Experimental Brain Research*, vol. 9, no. 1, 1969, p. 1-15. 37 refs.

Study of the relationships between the frog vestibular afferents and the cerebellum, as well as the efferent vestibular system, by electron microscopy and Nauta degeneration technique. The primary

vestibular fibers were found to have synaptic boutons in both the granular and the molecular layers of the cerebellar marginal zone. In the granular layer synaptic contacts are made with the granule cell dendrites, while the molecular layer projection is directed to the main dendrites of the Purkinje cells in a manner similar to that of the climbing fibers. As for the efferent system, the vestibular receptor cells of the macula saccularis are contacted by vesicle-filled boutons which terminate synaptically in relation to a submembranous sac within the cell. G.R.

#### A70-10352 THE INHIBITORY VESTIBULAR EFFERENT SYSTEM AND ITS RELATION TO THE CEREBELLUM IN THE FROG.

R. Llinás and W. Precht (AMA/ERF, Institute for Biomedical Research, Chicago, Ill.).

*Experimental Brain Research*, vol. 9, no. 1, 1969, p. 16-29. 31 refs.

Study of the inhibitory vestibular efferent system and its relation to the cerebellum on the basis of experiments carried out in bull frogs (*Rana catesbeiana*) following pentobarbital anesthesia or immobilization by lateral sectioning of the brachial and lumbar plexus and light anesthesia with MS-222. It was found that peripheral stimulation of the anterior and posterior branches of the eighth nerve evokes antidromic activation of Purkinje cells in the ipsilateral cerebellar ariculum. The antidromic Purkinje cell invasion is followed by orthodromic action potentials due to the activation of direct and secondary vestibulocerebellar afferents. As a result of the investigations, it is concluded that a direct cerebello-otolith efferent system represented by axons of Purkinje cells is present in the frog. This cerebello-otolith system, which is shown to be inhibitory, represents the first demonstration of cerebellar control of a sensory input. G.R.

#### A70-10353 FUNCTIONAL ORGANIZATION OF THE VESTIBULAR AFFERENTS TO THE CEREBELLAR CORTEX OF FROG AND CAT.

W. Precht and R. Llinás (AMA/ERF, Institute for Biomedical Research, Chicago, Ill.).

*Experimental Brain Research*, vol. 3, no. 1, 1969, p. 30-52. 50 refs.

Description of experiments undertaken in order to provide an analysis of the mode of termination of primary and secondary vestibular fibers in the cerebellar cortex of the frog and cat. Field and unitary potentials evoked in the vestibulocerebellum of frog and cat following vestibular nerve stimulation were recorded with microelectrodes and correlated with their site of origin in the various layers of the cerebellar cortex. In the frog, primary vestibular fibers project both as mossy and as climbing fibers onto the cerebellar ariculum lobe. Secondary vestibulocerebellar fibers seem to end exclusively as mossy fibers in the ariculum. As a consequence of this dual projection, extra- and intracellular recordings from Purkinje cells in the ariculum lobe show two kinds of responses to vestibular nerve stimulation. The field and unitary potentials evoked in the cat nodulus, flocculus, and uvula following vestibular nerve stimulation are shown to be generated by mossy fibers exclusively. G.R.

#### A70-10359 # ADRENOCORTICAL RESPONSES TO EXPOSURE TO A SUB-TROPICAL CLIMATE.

Ira L. Shannon and Henry B. Hale (USAF, School of Aerospace Medicine, Brooks AFB, Tex.).

*Aerospace Medicine*, vol. 40, Oct. 1969, p. 1057-1059. 20 refs.

Military recruits who were undergoing basic training in San Antonio, Tex., were examined for evidence of climate-related adrenocortical change. The study was run over a 52-week period, with a different group of 10 or 11 subjects under study each week.

Serum 17-OHCS determinations were made at 0730, 1130, and 1530 hours, with the subjects fasting, inactive, and at thermoneutrality. Urinary 17-OHCS measurements were carried out on 4-hr urine specimens collected at 1130 and 1530 hours. The seasonal variation found for serum 17-OHCS was statistically significant, but that found for urinary 17-OHCS was not. The patterns of variation over the seasons for serum 17-OHCS were not the same at the different times of day. The 0730 serum 17-OHCS data indicated (1) equality for the winter and autumn groups, (2) mild hyperactivity for the spring group, and (3) mild hypoactivity for the summer group.

(Author)

## A70-10360

## CARDIAC OUTPUT AND CORONARY BLOOD FLOW DURING STEADY STATE HYPOXIA.

Lawrence E. Lamb, Adrian D. LeBlanc, Roy J. Kelly, Wilbur L. Smith, and Philip C. Johnson (Baylor University, College of Medicine, Dept. of Medicine, Houston, Tex.).

*Aerospace Medicine*, vol. 40, Oct. 1969, p. 1060-1064. 8 refs.

Research supported by the Jewish Institute for Medical Research; PHS Grant No. HE-05435.

Twenty-three subjects were studied while breathing room air, and 14 and 12 per cent oxygen. The subjects breathing 12 per cent oxygen demonstrated an increase in coronary blood flow (CBF) as measured by an Rb-84 technique. The CO and blood pressure did not vary appreciably. The relationship between arterial oxygen content and Rb-84 CBF is discussed. Hypoxia offers an alternative to exercise to moderately increase CBF, which may be of limited use when exercise is not possible.

(Author)

## A70-10361

## DYSBARISM—ROLE OF FAT EMBOLIZATION TO THE LUNG.

John T. Kalberer, Jr. (New York University; Beth Israel Medical Center, Dept. of Laboratories, New York, N.Y.).

*Aerospace Medicine*, vol. 40, Oct. 1969, p. 1068-1075. 37 refs.

PHS Grant No. AM-08850; Contract No. AF 41(690)-91557.

Experiments designed to explore the possible role of lung lipid embolization in decompression sickness were performed on obese mice, which are susceptible to decompression sickness, and on their thin littermates, which are not susceptible. Lipid globules were found in lungs of both compressed-decompressed mice and in non-compressed controls. In none of the experimental procedures did the incidence of fat embolization correlate with the severity of the dysbaric syndrome. In addition, when compared with non-compressed obese controls, thin littermate mice, whose livers contain no fat, showed as much embolization of the lungs as obese mice with normally occurring fatty livers. Although large bubble masses were observed in the long bones of obese and thin compressed-decompressed mice, the incidence of lipid globules in the lungs of these mice was almost equal to that of the corresponding controls (noncompressed). It is concluded that pulmonary fat embolization is not a necessary component of decompression sickness in mice susceptible to the dysbaric syndrome. Neurocirculatory collapse is induced by means other than fat embolization.

(Author)

## A70-10362 \*

## MODEL FOR VESTIBULAR ADAPTATION TO HORIZONTAL ROTATION.

Laurence R. Young and Charles M. Oman (Massachusetts Institute of Technology, Cambridge, Mass.).

(*Annual Symposium on the Role of the Vestibular Organs in the Exploration of Space, 4th, Pensacola, Fla., Sept. 1968.*)

*Aerospace Medicine*, vol. 40, Oct. 1969, p. 1076-1080. 10 refs.

Grants No. NGR-22-009-156; No. NGR-22-009-025; No. NsG-577.

Short-term adaptation effects are seen in subjective sensation of

rotation and vestibular nystagmus. The mathematical model for semicircular canal function is improved by the addition of two adaptation terms (approximately one-half-minute time constant for sensation and two-minute time constant for nystagmus) to the overdamped second-order description. Adaptation is represented as a shift of reference level based on the recent history of cupula displacement. This model accounts for the differences in time constants between nystagmus and subjective cupulograms, secondary nystagmus, and decreased sensitivity to prolonged acceleration.

(Author)

## A70-10363

## YEAR-LONG MEDICO-ENGINEERING EXPERIMENT IN A PARTIALLY CLOSED ECOLOGICAL SYSTEM.

A. I. Burnazian, V. V. Parin, Iu. G. Nefiodov, B. A. Adamovich, S. B. Maksimov, B. L. Goldshvend, N. M. Samsonov, and G. N. Kirikov (Institute for Bio-Medical Problems, Moscow, USSR).

*Aerospace Medicine*, vol. 40, Oct. 1969, p. 1087-1094. 10 refs.

Description of basic objectives of the year-long medicoengineering experiment carried out in 1967-1968. The manned experiment (in which three test subjects took part) was conducted with a closed life support system. The work briefly describes the system and main experimental stages. It also gives preliminary evaluation of the experimental findings.

(Author)

## A70-10364

## CHANGES IN PLATELETS AND LIPIDS IN EXPERIMENTAL AEROEMBOLISM AND BENDS.

M. L. Clark, R. B. Philip, and C. W. Gowdey (Western Ontario, University, Dept. of Pharmacology, London, Ontario, Canada).

*Aerospace Medicine*, vol. 40, Oct. 1969, p. 1094-1098. 22 refs.

Research supported by the Defence Research Board of Canada.

Platelet levels in rats, subsequently subjected to a bends-producing technique, were changed by injections of an antiplatelet serum. Thrombocytopenic rats were no more resistant to bends than control rats after either stage decompression or explosive decompression. Rats with thrombocytosis had a significantly higher incidence of bends than control rats. Previously, it was reported that total plasma lipids were reduced in rats with severe bends. Analysis by gas chromatography revealed no qualitative changes in the fatty acid methyl esters in the lipid fractions of rats showing signs of bends from those of controls, nor were there significant differences during the various stages of the bends-inducing procedure. Air bubbles infused intravenously into anesthetized rabbits caused a marked fall in blood pressure paralleled by a significant decrease in circulating platelets. When dextran was infused concurrently, the fall in platelet counts was minimal although the hypotensive response was still evident. These results substantiate previous evidence from this laboratory that platelets and plasma lipids may participate in the vascular occlusion associated with severe bends.

(Author)

## A70-10365

## HEARING ACUITY AND EXPOSURE TO PATROL AIRCRAFT NOISE.

William R. Pierson and Charles I. Barron (Lockheed Aircraft Corp., Lockheed-California Co., Human Engineering Dept. and Medical Dept., Burbank, Calif.).

*Aerospace Medicine*, vol. 40, Oct. 1969, p. 1099-1101. 5 refs.

The audiograms of aviators with long-time exposures to high-intensity, low-frequency noise of maritime patrol aircraft were compared with those of persons not having been so exposed. The results of the clinical and statistical evaluations indicated no permanent effects on hearing which might be attributed to patrol aircraft noise.

(Author)

## A70-10366 \*

## INTERVAL AT SEA-LEVEL PRESSURE REQUIRED TO PREVENT DECOMPRESSION SICKNESS IN HUMANS WHO FLY IN COMMERCIAL AIRCRAFT AFTER DIVING.

Peter O. Edel, Joseph J. Carroll, Robert W. Honaker, and Edward L. Beckman (J&J Marine Diving Co., Inc., Pasadena; NASA, Manned Spacecraft Center, Houston, Tex.).

*Aerospace Medicine*, vol. 40, Oct. 1969, p. 1105-1110. 10 refs.

Investigation of the susceptibility to decompression sickness of humans who breathe air while under increased pressure (as in scuba diving) and who then are exposed to an interval of decreased pressure (as in commercial airline flight). In order to evaluate the degree to which the nitrogen content of the fast, medium, and slow half-saturation-time tissues controls the occurrence of bends in decompression to altitude after diving, three different pressure-time profiles were tested. The interval spent at sea level after the exposure to pressure and prior to ascent to altitude was varied from five minutes to five hours. The frequency and severity of any decompression sickness that occurred were determined, and guidelines were thereby established to safeguard divers against decompression sickness when they fly in commercial aircraft after diving. (Author)

## A70-10367

## ACTIVITY RESPONSES TO ALTERED PHOTOPERIODS.

E. L. Besch (Kansas State University of Agriculture and Applied Science, College of Veterinary Medicine, Dept. of Physiological Sciences, Manhattan, Kan.).

*Aerospace Medicine*, vol. 40, Oct. 1969, p. 1111-1114. 12 refs.

NIH Grant No. FR-07036; Contract No. AF 44(620)-68-C-0020.

Locomotor activity responses to altered photoperiods were investigated in male, Sprague-Dawley rats exposed to several types of artificial days. In each 24-hr period, each group of animals was exposed to different light-dark (LD) fluctuations without an alteration in net photoperiod. In the 24-hr day (LD 12-12), the period length was about 24 hours and increased to about 25 hours when the animals were subjected to a 4-hr (LD 2-2) day. Further, there was a superposition of an exogenous 4-hr rhythm in LD 2-2 cycles on an endogenous circadian rhythm. During these short days (LD 2-2), periods of increased activity were uniformly associated with periods of dark and cold, and decreased activity with light and warm. Peak and low activity displayed phase shifts which were related to the change in the light-dark cycle. These phase shifts were apparent immediately with exposure to longer days. (Author)

## A70-10368 \* #

## DECOMPRESSION SICKNESS IN SIMULATED APOLLO SPACE-CABINS.

Domenic A. Maio, Thomas H. Allen, and Richard W. Bancroft (USAF, School of Aerospace Medicine, Brooks AFB, Tex.).

*Aerospace Medicine*, vol. 40, Oct. 1969, p. 1114-1118. 13 refs.

NASA-supported research.

Apollo space-cabin atmospheres were evaluated as to the influence of diluent nitrogen on the incidence of decompression sickness in 29 military men engaged in intermittent exercise. Following 3 hours of "shirtsleeve" exposure to oxygen at ground level (14.5 psia), one man suffered mild joint pain during 4 hours of exposure to 60 per cent oxygen and 40 per cent nitrogen at 5 psia. Upon subsequent decompression to 3.5 psia oxygen, his pain increased, and six additional men among the 29 also reported bends. Observations were also made as to time of "denitrogenation" at ground level prior to decompression directly to 3.5 psia suit equivalent. Only one among ten men was affected after 4 hours of ground-level oxygen exposure as compared with five among ten after 3.5 hours and eight among 11 after 3 hours of denitrogenation. Dissolved nitrogen in venous blood declined to a lower level during total exposure to oxygen at ground level than in a previous study

during oxygen breathing by mask with the body exposed to room air. Further, upon 4 hours of exposure to diluent nitrogen at 5 psia, the dissolved nitrogen in blood achieved equilibrium with alveolar nitrogen. In one of the simulated flights in which the incidence of decompression sickness exceeded 50 per cent, a statistically significant, positive correlation was found between maximum grade of bends and individual quantity of body fat. (Author)

## A70-10369

## NEW METHODS OF SKELETAL STATUS EVALUATION IN SPACE FLIGHT.

John R. Cameron, John M. Jurist, James A. Sorenson, and Richard B. Mazess (Wisconsin, University, Medical Center, Dept. of Radiology, Madison, Wis.).

*Aerospace Medicine*, vol. 40, Oct. 1969, p. 1119-1122. 17 refs.

Description of instrumentation for bone mineral measurement by monoenergetic photon absorptiometry. Bone elasticity is measured by determination of the speed of sound in bone. Comparison of absorptiometric mineral measurements with ash weights determined on autopsy specimens demonstrated an accuracy of 2 to 3 per cent; the reproducibility on living subjects over many months is 1 to 2 per cent. (Author)

## A70-10370

## ROLE OF HELMET LOSS IN HEAD INJURIES TO USAF AIRCREWS WHO EJECTED, 1963-1967.

Robert H. Bonner (USAF, Directorate of Aerospace Safety, Norton AFB, Calif.).

*Aerospace Medicine*, vol. 40, Oct. 1969, p. 1123-1125.

During the five-year period from 1963 through 1967, there were 838 ejections from USAF aircraft. In these, 122 individuals lost their helmets and four experienced helmet failure. It was found through analyzing the data that a three-fold increase in head injuries occurred with helmet loss. Helmet loss occurs most frequently during ejection and free-fall phases. The most frequently reported direction of helmet loss was from the back to the front of the head. It was concluded from the study that some method of positive posterior fixation of the helmet to the aircrew member is necessary. (Author)

## A70-10371

## SYNCOPE AMONG AIRCREW EVALUATED AT THE USAF SCHOOL OF AEROSPACE MEDICINE.

P. M. Sundaram (Indian Air Force, Institute of Aviation Medicine, Bangalore, India).

*Aerospace Medicine*, vol. 40, Oct. 1969, p. 1126-1133. 16 refs.

Discussion of the various mechanisms by which loss of consciousness can be brought about from both the pathologic and physiologic viewpoints. The incidence of syncope in aircrews as revealed by various studies is presented. An analysis was made of 88 cases of syncope in aircrews during the years 1966 and 1967. Out of these cases, seven had occurred during flight but in none was syncope attributed to any factor in the flying environment. The study reveals that most of the cases (65) occurred in persons below 40 years. There seems to be no correlation between the experience (number of hours flown) and the incidence of syncope. It was noted that in over 60 per cent of the cases, there was no history of earlier episodes of unconsciousness. The percentage of cases recommended for flying did not differ much between those who had no previous episodes and those who had one or two episodes. (Author)

## A70-10372

**MICROCALORIMETRY OF THE PROCESSES OF COAGULATION IN NORMAL CONDITIONS AND AFTER EXPOSURE TO A CONSTANT MAGNETIC FIELD.**

L. A. Piruzian, M. A. Rozenfel'd, V. M. Glezer, and V. A. Lomonosov (Akademiia Nauk SSSR, Moscow, USSR).  
*Aerospace Medicine*, vol. 40, Oct. 1969, p. 1140, 1141.

The action of a constant magnetic field leads to acceleration of the coagulatory process, accompanied by more intensive generation of heat. Thorough testing of this new, highly sensitive calorimetric method, capable of registering disturbances in the coagulatory system of the blood, will make possible its use as a new test in clinical and experimental applications. (Author)

## A70-10435

**FIVE CASES OF INTERMITTENT LEFT ANTERIOR HEMI-BLOCK.**

Mauricio B. Rosenbaum, Marcelo V. Elizari, Raúl J. Levi, Gerardo J. Nau, Norberto Pisani, Julio O. Lazzari, and Mabel S. Halpern (Salaberry Hospital; Argerich Hospital, Buenos Aires, Argentina).  
*American Journal of Cardiology*, vol. 24, July 1969, p. 1-7. 20 refs.

Description of the first 5 cases of intermittent left anterior hemiblock (block in the anterior division of the left bundle branch). These cases can be considered exceptional experiments of nature, providing (1) invaluable evidence for the existence of left anterior hemiblock and (2) useful material for studying, with great accuracy, the changes that this conduction disturbance produces on the previously normal or abnormal electrocardiogram in man. Three major electrocardiographic features of left anterior hemiblock are described. (Author)

## A70-10436

**HIGH GAIN, HIGH FREQUENCY ATRIAL VECTORCARDIOGRAMS IN NORMAL SUBJECTS AND IN PATIENTS WITH ATRIAL ENLARGEMENT.**

Ronald H. Selvester and L. Julian Haywood (Rancho Los Amigos Hospital, Downey, Calif.).  
*American Journal of Cardiology*, vol. 24, July 1969, p. 8-17. 25 refs. PHS Grants No. HE-10722; No. HE-07888; No. HE-09123; No. HE-09725.

Analysis of atrial forces in three planes of the timed vector cardiogram for magnitude and direction in 100 normal subjects and 304 patients with proved heart disease. In the horizontal plane, a value of the initial half of the P loop or right atrial component of 0.06 mV anteriorly for an adult (or 0.08 mV for a child) included all normal subjects for two standard deviations. Values in excess of these figures were consistent with right atrial enlargement. In the horizontal plane, a left atrial vector of 0.045 mV or less included 96 per cent of the normal subjects, both children and adults; hence, posterior displacement of more than 0.05 mV of the late portion of the P loop was evidence of left atrial enlargement. A leftward displacement of this component of 0.10 mV or more in adults (0.14 mV in children) also exceeded normal limits and was taken as evidence of left atrial enlargement. G.R.

## A70-10437

**TIME SEQUENCE OF RIGHT AND LEFT ATRIAL DEPOLARIZATION AS A GUIDE TO THE ORIGIN OF THE P WAVES.**

Rashid A. Massumi, Rajindra K. Sarin, Amir A. Tawakkol, Jorge C. Rios, and Howard Jackson (District of Columbia General Hospital, Cardiopulmonary-Angio Laboratory; George Washington University, Div. of Medicine, Washington, D.C.).

*American Journal of Cardiology*, vol. 24, July 1969, p. 28-36. 13 refs.

Research supported by the Washington Heart Association; PHS Grants No. 5-S01-FR-5359-06; No. 5 T1-HE-5311-08.

Study of the time sequence of right atrial and left atrial depolarization as a guide to the origin of ectopic atrial beats in 46 patients with heart disease, in 36 patients after electrical stimulation of known areas of the two atria, and in 10 patients with ectopic atrial rhythms. A direct right atrial and a bipolar esophageal lead were recorded simultaneously with one or more limb and chest leads on a photographic recorder. A catheter-pacemaker assembly was used for electrical stimulation of the atria. It was found that right atrial depolarization always preceded the left by an average of 0.04 sec in all instances of normal sinus rhythm and after stimulation of the right atrium. Conversely, the left atrial component of the P wave occurred before the right by an average of 0.037 sec when the wall of the left atrium was stimulated. It is concluded that the sequence of right and left atrial depolarization is a useful and possibly indispensable measure for determining the origin of the P waves. G.R.

## A70-10438

**AUTOIMMUNITY TO THE HEART IN CARDIAC DISEASE.**

Melvin H. Kaplan and J. Dermot Frengley (Case-Western-Reserve University, School of Medicine; Metropolitan General Hospital, Dept. of Medicine, Cleveland, Ohio).

*American Journal of Cardiology*, vol. 24, Oct. 1969, p. 459-473. 71 refs.

PHS Grant No. H-3726.

Review of published data regarding autoimmunity to the heart in cardiac diseases, indicating current and future directions of investigation. Current information on the role of immune mechanisms in rheumatic fever, postcardiotomy and postinfarction syndromes, cardiomyopathies, and other cardiac disorders is reviewed. The possible role of autoimmunity is emphasized in view of the evidence that serum antibodies reactive with heart tissue constituents may frequently be detected in a number of cardiac disorders, presumably as a result of stimulation by antigens that have been released or altered by myocardial injury due to infection, infarction, cardiac surgery, or trauma to the heart or pericardium. The relation between induced antibodies to heart tissue (such as those resulting from streptococcal infection) and underlying cardiac disease, postcardiotomy and postinfarction complications, and the pathogenesis of rheumatic fever and other forms of carditis is investigated. O.H.

## A70-10439

**THE CORONARY COLLATERAL CIRCULATION IN LIVING MAN.**

Goffredo G. Gensini and Braz C. Bruto da Costa (St. Joseph's Hospital, Research Dept. and Msgr. Toomey Cardiovascular Laboratory, Syracuse, N.Y.).

*American Journal of Cardiology*, vol. 24, Sept. 1969, p. 393-400. 11 refs.

Description of the collateral circulation of the coronary arteries in life as studied by the selective angiographic technique. A comprehensive laboratory study of the coronary arteriograms of 100 patients in a search for the presence or absence of coronary collaterals is discussed. The results show that the coronary arteriograms of 53 of the 100 patients studied were either normal or showed less than 50 per cent reduction of lumen diameter. The remaining 47 patients had severe coronary atherosclerotic obstruction resulting in more than 50 per cent reduction in the diameter of the lumen of a coronary trunk or major branch. There was collateral circulation in 37 cases. Among them, five had normal electrocardiograms, in 13 the existence of collaterals was inferred by visualization of an artery distal to a complete occlusion or from its opacification after injection of contrast agent into the heterolateral

artery, and in the remaining 24 continuity could be traced from the feeding artery through the collateral vessel into the recipient vessel. Several patterns of anastomotic pathways are described. It is demonstrated that the visualization of interarterial coronary anastomoses is a reliable indirect sign of significant coronary artery disease and may account for a normal resting electrocardiogram even in patients with major arterial occlusion. O.H.

#### A70-10440

**EFFECTS OF ARTERIAL HYPOXEMIA AND HYPEROXIA ON OXYGEN AVAILABILITY FOR MYOCARDIAL METABOLISM—PATIENTS WITH AND WITHOUT CORONARY HEART DISEASE.** William A. Neill (Oregon, University, Medical School, Dept. of Medicine, Portland, Ore.).

*American Journal of Cardiology*, vol. 24, Aug. 1969, p. 166-171. 12 refs.

PHS Grant No. HE-10433.

Nineteen patients breathed different gas mixtures to induce arterial hypoxemia and hyperoxia. In ten patients without heart disease, the level of coronary venous blood oxygen saturation fell during moderate arterial hypoxemia (oxygen saturation 64 to 85 per cent) and rose during arterial blood hyperoxia. However, the coronary venous blood lactate/pyruvate concentration ratio (L/Pv) remained nearly constant, thereby providing evidence that the blood oxygen changes did not reflect changes in oxygen availability for myocardial metabolism. During severe arterial hypoxemia (oxygen saturation 47 to 58 per cent), in one of three patients the myocardium produced lactate, which is a sign of supplementary anaerobic metabolism. In most of the nine patients with coronary heart disease, the changes in coronary venous blood oxygen saturation were similar to those in the control patients. However, exceptions occurred. In three patients with coronary heart disease, moderate arterial hypoxemia increased the L/Pv, thus suggesting myocardial hypoxia. In two of these, the myocardium produced lactate (anaerobic metabolism). L/Pv remained constant during hyperoxia; therefore, there is no evidence that the blood hyperoxia augmented myocardial oxygen availability or relieved chronic myocardial hypoxia. (Author)

#### A70-10441

**LIPID AND CARBOHYDRATE ABNORMALITIES IN PATIENTS WITH ANGIOGRAPHICALLY DOCUMENTED CORONARY ARTERY DISEASE.**

Robert A. Heinle, Robert I. Levy, Donald S. Frederickson (Harvard University, Harvard Medical School, Peter Bent Brigham Hospital, Boston, Mass.), and Richard Gorlin (U.S. Public Health Service, National Heart Institute, Molecular Disease Branch, Bethesda, Md.). *American Journal of Cardiology*, vol. 24, Aug. 1969, p. 178-186. 16 refs.

NIH Grants No. HE-RO-1-8591; No. HE-IT1-5679; No. 5-F2-HE-28,864-02.

Results of a study of lipid and carbohydrate behavior in a group of 134 patients with angiographically documented coronary artery disease. An increased incidence of both abnormal lipoprotein patterns and abnormal reactions to glucose tolerance tests is established in the patients. Ninety-six per cent of the subjects in the age group below fifty showed one or both of these metabolic abnormalities, and 80 per cent showed an abnormal lipoprotein pattern. The lipoprotein abnormalities were almost equally divided between type II and type IV. The presence of a carbohydrate abnormality did not alter the age of the occurrence of coronary artery disease; both the type II and IV lipoprotein abnormalities did decrease the mean age of the occurrence of the disease by approximately seven years. The importance of determining specific metabolic abnormalities in coronary artery disease diagnostics and therapy is noted. V.Z.

#### A70-10442

**MECHANISMS IN RECIPROCAL RHYTHM.**

Leo Schamroth and Karl F. Yoshonis.

*American Journal of Cardiology*, vol. 24, Aug. 1969, p. 224-233. 14 refs.

Discussion of mechanisms leading to the occurrence of reciprocal rhythm, a condition arising when the atrial or ventricular chamber is activated two or more times by the same impulse. It is shown that the presence of two separate A-V nodal pathways is an essential prerequisite of this condition. The two pathways may communicate with each other in the upper or lower portion of the A-V node to form upper or lower common pathways. The presence of a unidirectional block in one of the two pathways is necessary for the initiation of a reciprocal rhythm condition. V.Z.

#### A70-10464

**ERYTHROPOIESIS IN DIFFUSION CHAMBERS DURING HYPOXIA.**

Russel H. Meints and Gary VanZant (Nebraska, University, Dept. of Zoology, Lincoln, Neb.).

*Life Sciences, Part I—Physiology and Pharmacology*, vol. 8, Oct. 1, 1969, p. 1041-1045. 11 refs.

Study of erythropoiesis of bone marrow cultured in diffusion chambers under hypoxic conditions. Bone marrow suspensions were cultured in diffusion chambers implanted in animals kept for six days under hypoxic conditions. It is shown that under an appropriate extrinsic stimulus, such as hypoxia, the bone marrow cultures show significant erythropoietic activity. The *in vivo* culture in diffusion chambers provides a possible system for analysis of differentiation control factors present under hypoxic stimulation. O.H.

#### A70-10465 #

**THERMOREGULATORY SALIVATION PROPORTIONAL TO HYPOTHALAMIC TEMPERATURE ABOVE THRESHOLD IN THE DOG.**

F. Sharp, D. Smith, M. Thompson, and H. T. Hammel (California, University, Scripps Institution of Oceanography, Physiological Research Laboratory, La Jolla, Calif.).

*Life Sciences, Part I—Physiology and Pharmacology*, vol. 8, Oct. 1, 1969, p. 1069-1076.

Contract No. AF 33(615)-69-C-1024.

Study of thermoregulatory salivary responses of a dog to ambient temperatures, with emphasis on the threshold and proportionality constant for salivation at 15, 25, and 35 deg C. A description is given of the test methods and procedure used in this investigation, and the results obtained are plotted graphically and discussed. The threshold temperatures for thermoregulatory salivation are given, and it is shown that the proportionality constant for the salivation response seems to be the same for the three ambient temperatures. The salivation response appears to be activated by a proportional control with an adjustable set temperature. O.H.

#### A70-10471

**APPLICATION OF NEWTON'S LAW TO BODY COOLING.**

G. W. Molnar, H. J. Hurley, Jr., and R. Ford (U.S. Veterans Administration, Hospital, Little Rock, Ark.).

*Pflügers Archiv*, vol. 311, no. 1, 1969, p. 16-24. 9 refs.

Newton's law of cooling was used to analyze the post mortem fall in rectal temperature in 55 cases during refrigeration in a mortuary. As with solids of low thermal conductivity, there was an initial curvilinearity to the semilog plot lasting 1 to 11 hours (related to pelvic circumference) while the proper internal temperature distribution was becoming established. Thereafter there was a linear

trend representing a constant per cent cooling rate which lasted up to 24 hours for adults. This was followed by a less steep trend of cooling rate which was 37 per cent less than the first rate. This diminution in cooling rate occurred when the rectal temperature fell below 10 deg C and was ascribed to a reduction in the thermal diffusivity of fat. The first rate had the highest correlation with pelvic circumference. (Author)

## A70-10472

## INTEGRATED STATIC ACTIVITY OF LINGUAL COLD RECEPTORS.

H. Benzing, H. Hensel, and R. Wurster (Marburg, Universität, Physiologisches Institut, Marburg an der Lahn, West Germany). *Pflügers Archiv*, vol. 311, no. 1, 1969, p. 50-54. 11 refs.

Static discharge frequencies of 72 single or multiple cold fiber preparations from the lingual nerve of the cat were measured as a function of constant temperatures of the tongue. The average maximum discharge was at about 27 deg C. At 10 and 40 deg C, some cold receptors were still firing continuously. (Author)

## A70-10473

## THE STATE OF DISTENSION OF THE ATRIA UNDER THE INFLUENCE OF ARTIFICIAL CHANGES IN THE HEART RATE OF ANESTHETIZED CATS (DER DEHNUNGSZUSTAND DER HERZVORHÖFE UNTER DEM EINFLUSS KÜNSTLICHER HERZFREQUENZÄNDERUNGEN BEI NARKOTISIERTEN KATZEN).

Frank D. Mersch and Joachim O. Arndt (Berlin, Freie Universität, Physiologisches Institut, Berlin, West Germany). *Pflügers Archiv*, vol. 311, no. 1, 1969, p. 55-72. 38 refs. In German. Research supported by the Deutsche Forschungsgemeinschaft; Contract No. AF 61(052)-947.

Study of the effect of artificially induced changes in heart rate on atrial circumference and atrial pressure in anesthetized cats. Both parameters studied were found to be smallest for the spontaneous heart rate of any given animal and were found to increase with tachycardia and bradycardia, respectively. During the atrial filling phase, the slope of the circumference curve increased proportionally to the increasing heart rate. The increase in static atrial distension and also the enhanced atrial wall pulsation seem to augment the afferent nerve impulse traffic from the stretch receptors, which are located within the atria. Their increased activity in turn triggers a volume regulatory diuretic reflex. Thus, the data suggest that the diuresis which occurs in patients during paroxysmal tachycardia is reflexly induced from the atria. G.R.

## A70-10493

## SURVIVAL IN SPACE.

Iuri Gagarin and Vladimir Lebedev. New York, Frederick A. Praeger, Inc., 1969. 166 p. Translation. \$5.95.

Translation of a popular Russian book reviewing the experiences and impressions of Soviet astronauts during ground simulation tests and orbital flights against a general background of the history and advances of aeronautics, astronautics, and related sciences. The human aspects of space flight outlined briefly include man-machine relations; psychological, emotional, and behavioral problems of spacecraft crew members; and the performance of a daily routine under conditions of weightlessness. Numerous quotations from prominent scientists, philosophers, and political leaders are used as illustrations of subjective sensations of astronauts. V.Z.

## A70-10494

## BIOMECHANICS; PROCEEDINGS OF THE FIRST ROCK ISLAND ARSENAL BIOMECHANICS SYMPOSIUM, AUGUSTANA COLLEGE, ROCK ISLAND, ILL., APRIL 5, 6, 1967.

Symposium sponsored by the U.S. Army and Augustana College. Edited by David Bootzin and H. C. Muffley (U.S. Army, Rock Island Arsenal, Rock Island, Ill.). New York, Plenum Press, 1969. 190 p. \$15.

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SEEKING MATHEMATICAL MODELS FOR SKILLED ACTIONS. P. H. Greene (Chicago, University, Chicago, Ill.), p. 149-180. 16 refs. (See A70-10498 01-05)

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## A70-10495

## HUMANOID COVER-SEEKING AND OBSTACLE-AVOIDANCE FUNCTIONS.

Leonard A. Cohen (Albert Einstein Medical Center, Dept. of Physiology, Philadelphia, Pa.).

IN: BIOMECHANICS; PROCEEDINGS OF THE FIRST ROCK ISLAND ARSENAL BIOMECHANICS SYMPOSIUM, AUGUSTANA COLLEGE, ROCK ISLAND, ILL., APRIL 5, 6, 1967. (A70-10494 01-05)

Symposium sponsored by the U.S. Army and Augustana College.

Edited by David Bootzin and H. C. Muffley.

New York, Plenum Press, 1969, p. 39-49.

Examination of the physiological and engineering aspects of obstacle avoidance and cover-seeking systems of an exploratory unmanned vehicle used for military purposes. The vehicle proposed is equipped with sensors similar to the spatial orientation sensors of the human body. These sensors make it possible to accurately sense the direction and amount of any deviations from its course which are imposed by terrain features. The vehicle can then make appropriate adjustments to direct itself back on course toward its predetermined target. Special attention is given to the biomechanics of three separate mechanisms of the proposed vehicle concerned with: (1) focusing on an environmental object in the path of the vehicle, (2) judging the distance of the object, and (3) determining whether the object represents an obstacle or constitutes adequate cover. Z.W.

## A70-10496

## DYNAMIC SHAPE RECOGNITION.

Gabriel E. Lowitz (TRW Systems Group, Redondo Beach, Calif.).

IN: BIOMECHANICS; PROCEEDINGS OF THE FIRST ROCK ISLAND ARSENAL BIOMECHANICS SYMPOSIUM, AUGUSTANA COLLEGE, ROCK ISLAND, ILL., APRIL 5, 6, 1967. (A70-10494 01-05)

Symposium sponsored by the U.S. Army and Augustana College.

Edited by David Bootzin and H. C. Muffley.

New York, Plenum Press, 1969, p. 95-104.

Description of a technique which maps in the time domain the corner information of spatial imagery. The method described is simple to implement and can be applied in real time by processing the video signal painting the frame of imagery to be analyzed. The slit aperture is the duration of one line or a few adjacent lines; the spatial integration is then replaced by the time integration corresponding to the duration of these lines. The resulting signal, though discrete in nature, is absolutely analogous to a certain cross-correlation function. Certain abstract structural features of the spatial imagery can be retrieved from this process with a considerable reduction on the information rate. The response of the dynamic slit system to a corner is examined. An analysis is made of the noise due to imperfect geometry and of the perturbations caused by spatial and other sources of noise. As an example, the retrieval of geometrical shape information from a parallelogram and a triangle is presented.

Z.W.

## A70-10497

## CENTRAL ISSUES CONCERNING THE NERVOUS PERIPHERY.

Robert C. Gesteland (Northwestern University, Dept. of Biological Sciences, Evanston, Ill.).

IN: BIOMECHANICS; PROCEEDINGS OF THE FIRST ROCK ISLAND ARSENAL BIOMECHANICS SYMPOSIUM, AUGUSTANA COLLEGE, ROCK ISLAND, ILL., APRIL 5, 6, 1967. (A70-10494 01-05)

Symposium sponsored by the U.S. Army and Augustana College.

Edited by David Bootzin and H. C. Muffley.

New York, Plenum Press, 1969, p. 129-137. 28 refs.

NIH Grants No. 1-R01-NB06063-01A1; No. FR-00018-14; Contracts No. AF 33(615)-67-C-1497; No. N 00014-67-A-0356-0003.

Brief discussion of what is known and not known about the common animal senses. The most primitive sort of sensitivity is response of a cell to a change in the chemical constitution of its surroundings. Other receptors respond to mechanical strain caused by sound, vibration, and pressure; electromagnetic radiation in the visible, ultraviolet, and infrared regions of the spectrum; heat; and electric current. It is regarded as desirable to know the molecular basis for the action of the irritable membrane and to find a way to relate the generator processes acting on receptor cells, the anatomy of nerve-cell interconnections, and the patterns of spike activity which result. These are classic questions of natural philosophy restated in the mechanistic terms of the present era. Success will not be achieved in synthesizing a sensory machine modeled on nature's sensory systems until some sensible hypotheses for the functioning of these systems are produced.

F.R.L.

## A70-10498 #

## SEEKING MATHEMATICAL MODELS FOR SKILLED ACTIONS.

Peter H. Greene (Chicago, University, Chicago, Ill.).

IN: BIOMECHANICS; PROCEEDINGS OF THE FIRST ROCK ISLAND ARSENAL BIOMECHANICS SYMPOSIUM, AUGUSTANA COLLEGE, ROCK ISLAND, ILL., APRIL 5, 6, 1967. (A70-10494 01-05)

Symposium sponsored by the U.S. Army and Augustana College.

Edited by David Bootzin and H. C. Muffley.

New York, Plenum Press, 1969, p. 149-180. 16 refs.

Contract No. Nonr-2121(17).

Attempt to understand perception and skilled action in man or machine. A summary of the investigation reveals some new mathematical problems that may be important in studying the same systems that are already being studied elsewhere from another viewpoint. The area in which these problems lie is explained, and the reasons why they seem important are given. Customary formulations and a common feature of some successful systems are discussed. An introduction to new problems is presented, including a description of what they should contain. A summary of items that a sensorimotor theory should contain is presented.

F.R.L.

## A70-10499

## CONTROL OF POSTURE AND MOTION.

Warren S. McCulloch (Massachusetts Institute of Technology, Research Laboratory of Electronics, Cambridge, Mass.).

IN: BIOMECHANICS; PROCEEDINGS OF THE FIRST ROCK ISLAND ARSENAL BIOMECHANICS SYMPOSIUM, AUGUSTANA COLLEGE, ROCK ISLAND, ILL., APRIL 5, 6, 1967. (A70-10494 01-05)

Symposium sponsored by the U.S. Army and Augustana College.

Edited by David Bootzin and H. C. Muffley.

New York, Plenum Press, 1969, p. 181-185.

NIH Grant No. 5 ROI NB-04985-04.

Discussion of the main features of the system of control of posture and motion. Special attention is given to the different kinds of reflexes concerned with motion, and to the relation between the suprasegmental structures and the organs controlling posture or movement. The evolution and the role of the lower nervous systems in animals are discussed.

Z.W.

## A70-10501 #

## SYSTEMS. COMPLEXITY. DYNAMICS (SISTEMY. SLOZHNOST'. DINAMIKA).

Lu. G. Antomonov.

Kiev, Izdatel'stvo Naukova Dumka, 1969. 128 p. 37 refs. In Russian.

An attempt is made to present guidelines for studying the dynamics of the organization of complex systems as represented by theoretical models of control systems and by the behavioral activities of human operators and animals. The topics covered include control systems organization principles, the concept of complexity dynamics, and the contributions of nervous system structural elements and neuron networks to cerebral activity. Discussed specifically are the functions and structure of biological analysors, the methods of estimating the structural diversification of neuron information, the concept of unit information, an optimal approach to organization dynamics, the probability dynamics of various biological reflex systems, and neuron-function self-organization and optimization. Also considered are some applications of higher mathematics of the neurons. The booklet is addressed to engineers, biologists, and advanced students specializing in this field.

V.Z.

## A70-10503 #

## HIGHER CORTICAL FUNCTIONS OF MAN AND THEIR DISORDERS DUE TO LOCAL BRAIN INJURIES (VYSSHIE KOR-KOVYE FUNKTSII CHELOVEKA I IKH NARUSHENIIA PRI LOKAL'NYKH PORAZHENiiAKH MOZGA) (2nd Revised Edition).

A. R. Luriiia.

Moscow, Izdatel'stvo Moskovskogo Universiteta, 1969. 509 p. 936 refs. In Russian.

The results of many years of study of higher nervous activity in humans by the author and his colleagues are reviewed. Emphasis is placed on disorders in the cortical functions due to local brain injuries. The types of cortical function disorders discussed specifically include those due to damage to the temporal, occipital, parietal, sensorimotor, and frontal sections of the brain. The methods used in these studies are also described. These methods pertain to the neuropsychological studies of motor functions, audiomotor coordination, higher cutaneous-kinesthetic and visual functions, and vocal functions, as well as to studies of the processes of thinking, learning, reading, writing, and counting.

V.Z.

## A70-10504

## PROBLEMS OF BRAIN BIOCHEMISTRY. VOLUME 4 (VOPROSY BIOKHMII MOZGA. VOLUME 4).

Edited by G. Kh. Buniatian (Akademiia Nauk Armianskoi SSR, Institut Biokhimii, Yerevan, Armenian SSR).  
Yerevan, Izdatel'stvo Akademii Nauk Armianskoi SSR, 1968. 278 p.  
In Russian and Armenian.

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INFLUENCE OF GAMMA-AMINO BUTYRIC ACID ON THE OXIDATIVE PHOSPHORYLATION IN BRAIN MITOCHONDRIA (VLIANIE GAMMA-AMINOMASLIANOI KISLOTY NA OKISLITEL'NOE FOSFORILIROVANIE V MITOKHONDRIIAKH MOZGA). G. Kh. Buniatian and A. A. Simonian (Akademiia Nauk Armianskoi SSR, Yerevan, Armenian SSR), p. 131-148. 35 refs. (See A70-10509 01-04)

INFLUENCE OF GAMMA-AMINO BUTYRIC ACID ON THE SEROTONIN CONTENT OF THE BRAIN. N. A. Esaian and A. R. Armenian (Akademiia Nauk Armianskoi SSR, Yerevan, Armenian SSR), p. 149-156. 27 refs. (See A70-10510 01-04)

INFLUENCE OF THYROIDIN ON THE CONTENT AND NUCLEOTIDE COMPOSITION OF THE RNA OF THE HYPOTHALAMUS, CORTEX, AND VARIOUS PHENOLIC FRACTIONS OF THE CEREBRAL HEMISPHERES (VLIANIE TIREOIDINA NA SODERZHANIE I NUKLEOTIDNYI SOSTAV RNK GIPOITALAMUSA, KORY I OTDEL'NYKH FENOL'NYKH FRAKTSII BEL'SHIKH POLUSHARII GOLOVNOGO MOZGA). Zh. A. Chalabian (Akademiia Nauk Armianskoi SSR, Yerevan, Armenian SSR), p. 165-173. 13 refs. (See A70-10511 01-04)

THE ROLE OF THE ORNITHINE CYCLE AND ITS COMPONENTS (O ROLI ORNITINOVOGO TSIKLA I EGO KOMPONENTOV). M. A. Davtian (Akademiia Nauk Armianskoi SSR, Yerevan, Armenian SSR), p. 237-266. 409 refs. (See A70-10513 01-04)

CURRENT CONCEPTS OF CATECHOLAMINES (SOVREMENNYE PREDSTAVLENIIA O KATEKHOLAMINAKH). N. A. Esaian and E. K. Kazarova (Akademiia Nauk Armianskoi SSR, Yerevan, Armenian SSR), p. 211-235. 169 refs. (See A70-10512 01-04)

## A70-10505 #

## DEAMINATION OF NAD AND THE ROLE OF DEAMINO-NAD IN THE FORMATION OF AMMONIA FROM AMINO ACIDS IN BRAIN AND LIVER TISSUE (DEAMINIROVANIE NAD I ROL' DEAMINO-NAD V OBRAZOVANII AMMIKA IZ AMINOKISLOT V MOZGOVOI I PECHENOCHNOI TKANIAKH).

S. G. Movsesian, G. Kh. Buniatian, and R. F. Manasian (Akademiia Nauk Armianskoi SSR, Institut Biokhimii, Yerevan, Armenian SSR).  
IN: PROBLEMS OF BRAIN BIOCHEMISTRY. VOLUME 4 (VOPROSY BIOKHMII MOZGA. VOLUME 4). (A70-10504 01-04)  
Edited by G. Kh. Buniatian.

Yerevan, Izdatel'stvo Akademii Nauk Armianskoi SSR, 1968, p. 5-27. 60 refs. In Russian.

Discussion of experiments performed on rabbits and white rats, which provide new evidence for the deamination of nicotinamide adenine dinucleotide (NAD) and the reamination of nicotinamide hypoxanthine dinucleotide (deamino-NAD). NAD was added to liver mitochondrial preparations. The ammonia produced at the end of the incubation period was determined, and the supernatant was fractionated by DEAE-cellulose. The NAD and deamino-NAD were recovered from the same fraction. Using spectrometric techniques and the alcohol dehydrogenase reaction, it was found that at the end of the incubation period the amount of NAD is appreciably reduced with a corresponding rise in deamino-NAD. It is shown that in brain and liver mitochondrial preparations, deamino-NAD greatly enhances the formation of free ammonia from aspartic acid. In brain and particularly in liver tissue, NAD is deaminated while deamino-NAD is reaminated through the participation of aspartic acid. V.P.

## A70-10506 #

## DEAMINATION OF ADENOSINE DIPHOSPHATE AND REAMINATION OF INOSINE DIPHOSPHATE IN BRAIN TISSUE (DEAMINIROVANIE ADENOSINDIFOSFATA I REAMINIROVANIE INOZINDIFOSFATA V MOZGOVOI TKANI).

G. Kh. Buniatian and A. V. Arutiunian (Akademiia Nauk Armianskoi SSR, Institut Biokhimii, Yerevan, Armenian SSR).

IN: PROBLEMS OF BRAIN BIOCHEMISTRY. VOLUME 4 (VOPROSY BIOKHMII MOZGA. VOLUME 4). (A70-10504 01-04)  
Edited by G. Kh. Buniatian.

Yerevan, Izdatel'stvo Akademii Nauk Armianskoi SSR, 1968, p. 29-39. 47 refs. In Russian.

Investigation of the possibility of indirect deamination of ADP and reamination of the corresponding deamino form (IDP) in brain tissue. Experiments performed with dialyzed extracts of rabbit brain acetone powder show that divalent Zn, Cd, and Ni ions inhibit formation of ammonia from ADP and have practically no influence on the production of ammonia from adenylic acid. This is also true in the presence of p-chloromercuribenzoate. On the other hand, NaF acts to reduce the formation of ammonia from adenylic acid and has no effect on its production from ADP. These data indicate that the deamination of ADP and adenylic acid in the brain follows different paths. V.P.

## A70-10507 #

## INFLUENCE OF GAMMA-AMINO BUTYRIC ACID ON SOME ASPECTS OF GLUTAMIC AND ASPARTIC ACID METABOLISM IN THE CEREBRUM (VLIANIE GAMMA-AMINOMASLIANOI KISLOTY NA NEKOTORYE STORONY OBMENA GLUTAMINOVOI I ASPARAGINOVOI KISLOT V GOLOVNOM MOZGU).

E. N. Osipova (Akademiia Nauk Armianskoi SSR, Institut Biokhimii, Yerevan, Armenian SSR).

IN: PROBLEMS OF BRAIN BIOCHEMISTRY. VOLUME 4 (VOPROSY BIOKHMII MOZGA. VOLUME 4). (A70-10504 01-04)  
Edited by G. Kh. Buniatian.

Yerevan, Izdatel'stvo Akademii Nauk Armianskoi SSR, 1968, p. 69-80. 41 refs. In Russian.

Study of the changes in the concentrations of glutamic and aspartic acids in brain tissue and in an incubation medium caused by



the addition of glucose, gamma-aminobutyric acid, glutamic acid, and aspartic acid. It is found that addition of gamma-aminobutyric acid to a phosphate buffer (pH 7.4) under aerobic conditions does not increase the amount of glutamic acid but does somewhat increase the amount of aspartic acid. It is shown that gamma-aminobutyric acid enhances the passage of endogenous glutamic acid and aspartic acid into the incubation medium, and that it suppresses the accumulation of added glutamic acid in brain tissue. On the other hand, it does not affect the accumulation of added aspartic acid. V.P.

#### A70-10508 #

THE ROLE OF ASPARTIC ACID AND N-ACETYL-L-ASPARTIC ACID IN THE REGULATION OF THE METABOLISM OF GLUTAMINE AND GLUTAMIC ACID IN BRAIN TISSUE (O ROLI ASPARAGINOV I N-ATSETIL-L-ASPARAGINOV I KISLOT V REGULIATSII OBMENA GLUTAMINA I GLUTAMINOV I KISLOT V MOZGOV I TKANI).

V. S. Oganessian and G. Kh. Buniatian (Akademiia Nauk Armianskoi SSR, Institut Biokhimii, Yerevan, Armenian SSR).

IN: PROBLEMS OF BRAIN BIOCHEMISTRY. VOLUME 4 (VOPROSY BIOKHMII MOZGA. VOLUME 4). (A70-10504 01-04) Edited by G. Kh. Buniatian.

Yerevan, Izdatel'stvo Akademii Nauk Armianskoi SSR, 1968, p. 81-91. 58 refs. In Russian.

Investigation showing that deamidation of glutamine is greatly enhanced by the addition of N-acetyl-L-aspartic acid to mitochondrial preparations of rabbit brain incubated in Tris buffer. Under these conditions, the formation of ammonia is increased by 150 to 160 per cent as compared to control data. N-acetyl-DL-methionine, N-acetyl-L-alanine, and acetylglycine also increase deamination of glutamine, but to a lesser extent. Ammonia formation is increased by them by 40 to 50 per cent. Of the amino acids tested, only aspartic acid is found to enhance deamidation of glutamine, increasing the yield of ammonia by 85 per cent. The overall results indicate that aspartic acid and N-acetyl aspartic acid play an important part in the regulation of the metabolism of glutamine and glutamic acid. V.P.

#### A70-10509 #

INFLUENCE OF GAMMA-AMINO BUTYRIC ACID ON THE OXIDATIVE PHOSPHORYLATION IN BRAIN MITOCHONDRIA (VLIANIE GAMMA-AMINOMASLIANOI KISLOT NA OKISLITEL'NOE FOSFORILIROVANIE V MITOKHONDRIIAKH MOZGA).

G. Kh. Buniatian and A. A. Simonian (Akademiia Nauk Armianskoi SSR, Institut Biokhimii, Yerevan, Armenian SSR).

IN: PROBLEMS OF BRAIN BIOCHEMISTRY. VOLUME 4 (VOPROSY BIOKHMII MOZGA. VOLUME 4). (A70-10504 01-04) Edited by G. Kh. Buniatian.

Yerevan, Izdatel'stvo Akademii Nauk Armianskoi SSR, 1968, p. 131-148. 35 refs. In Russian.

Investigation of the factors governing the effect of gamma-aminobutyric acid on the oxidative phosphorylation of brain mitochondria. In the buffer solution used by Lovtrup (1961, 1964), at 37 deg C, gamma-aminobutyric acid has an insignificant effect on the respiration of the brain mitochondrial fractions of rabbits and rats, and has no effect on phosphorylation. However, in another medium, rich in potassium ions, it was found to enhance both respiration and oxidative phosphorylation at the same temperature. Its effect on the oxidative phosphorylation of brain mitochondria also depends on the incubation temperature and on the amount of the additions. It is shown that respiration of mitochondria and esterification of phosphorus, and thus the P/O, increase in proportion with the concentration of gamma-aminobutyric acid in the incubation mixture. V.P.

#### A70-10510 #

INFLUENCE OF GAMMA-AMINO BUTYRIC ACID ON THE SEROTONIN CONTENT OF THE BRAIN.

N. A. Esaian and A. R. Armenian (Akademiia Nauk Armianskoi SSR, Institut Biokhimii, Yerevan, Armenian SSR).

IN: PROBLEMS OF BRAIN BIOCHEMISTRY. VOLUME 4 (VOPROSY BIOKHMII MOZGA. VOLUME 4). (A70-10504 01-04) Edited by G. Kh. Buniatian.

Yerevan, Izdatel'stvo Akademii Nauk Armianskoi SSR, 1968, p. 149-156. 27 refs. In Armenian, with abstract in English.

Experimental investigation showing that 20 min after intraperitoneal administration (5 mg per kg) of gamma-aminobutyric acid, an increase in the 5-hydroxytryptamine level is observed in the midbrain. The effect lasts roughly 40 min. In vitro studies performed with rat midbrain fractions incubated in a phosphate buffer (pH 7.4) at 37 deg C for 45 min showed that additions of 30 to 300 micrograms per milliliter gamma-aminobutyric acid to the incubation medium had a strong inhibiting effect on the release of 5-hydroxytryptamine. V.P.

#### A70-10511 #

INFLUENCE OF THYROIDIN ON THE CONTENT AND NUCLEOTIDE COMPOSITION OF THE RNA OF THE HYPOTHALAMUS, CORTEX, AND VARIOUS PHENOLIC FRACTIONS OF THE CEREBRAL HEMISPHERES (VLIANIE TIREOIDINA NA SODERZHANIE I NUKLEOTIDNYI SOSTAV RNK GIPOTALAMUSA, KORY I OTDEL'NYKH FENOL'NYKH FRAKTSII BEL'SHIKH POLUSHARII GOLOVNOGO MOZGA).

Zh. A. Chalabian (Akademiia Nauk Armianskoi SSR, Institut Biokhimii, Yerevan, Armenian SSR).

IN: PROBLEMS OF BRAIN BIOCHEMISTRY. VOLUME 4 (VOPROSY BIOKHMII MOZGA. VOLUME 4). (A70-10504 01-04) Edited by G. Kh. Buniatian.

Yerevan, Izdatel'stvo Akademii Nauk Armianskoi SSR, 1968, p. 165-173. 13 refs. In Russian.

Experimental investigation of the influence of the hormones of the thyroid gland on the content and nucleotide composition of ribonucleic acids (RNA) in various regions of the brain. It is found that thyroidin reduces by 17 per cent the specific coefficient (ratio of guanine plus cytosine to adenine plus uracil) of RNA in the hypothalamic region due to an increase in the amount of uracil and a decrease in cytosine in RNA. Similar, but less pronounced, changes are observed in the cerebral cortex. It is shown that thyroidin enhances the formation of messenger RNA and thus accelerates the biosynthesis of proteins. V.P.

#### A70-10512 #

CURRENT CONCEPTS OF CATECHOLAMINES (SOVREMENNYE PREDSTAVLENIIA O KATEKHOLAMINAKH).

N. A. Esaian and E. K. Kazarova (Akademiia Nauk Armianskoi SSR, Institut Biokhimii, Yerevan, Armenian SSR).

IN: PROBLEMS OF BRAIN BIOCHEMISTRY. VOLUME 4 (VOPROSY BIOKHMII MOZGA. VOLUME 4). (A70-10504 01-04) Edited by G. Kh. Buniatian.

Yerevan, Izdatel'stvo Akademii Nauk Armianskoi SSR, 1968, p. 211-235. 169 refs. In Russian.

Survey of modern literature concerning the biosynthesis, distribution, combining, uptake, deposition, release, and metabolism of catecholamines. The participation of catecholamines in numerous physiological and pathological reactions of the organism is examined. The influence of some pharmacological preparations on the release, absorption, and deposition of catecholamines is also studied. V.P.

## A70-10513 #

## THE ROLE OF THE ORNITHINE CYCLE AND ITS COMPONENTS (O ROLI ORNITINOVOGO TSIKLA I EGO KOMPONENTOV).

M. A. Davtian (Akademiia Nauk Armianskoi SSR, Institut Biokhimii, Yerevan, Armenian SSR).

IN: PROBLEMS OF BRAIN BIOCHEMISTRY. VOLUME 4 (VOPROSY BIOKHIMII MOZGA. VOLUME 4). (A70-10504 01-04) Edited by G. Kh. Buniatian.

Yerevan, Izdatel'stvo Akademii Nauk Armianskoi SSR, 1968, p. 237-266. 409 refs. In Russian.

Survey of modern Soviet and foreign literature concerning the metabolism and biological activity of urea, citrulline, argininosuccinic acid, and other guanidine compounds in the organism. Evidence for the effect of these substances on various functions and metabolic reactions of the organism is presented. It is shown that the various enzymes of the urea cycle which are found in the various tissues of the organism, particularly in the brain, act to maintain an optimal level of these active substances in the tissues. The urea cycle serves as a mechanism of ammonia neutralization only in the liver of ureothelic animals, where ammonia is involved in the synthesis of citrulline. It is also shown that the arginase activity observed in animal tissue (particularly in the brain) is not associated with the mechanism of ammonia neutralization but plays an independent role in cellular metabolism. Possible participation of arginase activity in the regulation of the synthesis of histones is suggested. V.P.

## A70-10514

## SUBATMOSPHERIC DECOMPRESSION SICKNESS IN MAN.

D. I. Fryer (Royal Air Force, Farnborough, Hants., England).

Slough, Technivision Services (AGARDograph No. 125), 1969. 327 p. 584 refs. \$22.50.

A study is made of the effects of raised intrapulmonary pressure on the body and the reduction of these effects by applying specific compensating pressures to specific regions of the body. A history of this problem is presented, together with a survey of the literature. The physical aspects of altitude and its effects on a man are examined. A discussion is presented of the acute clinical manifestations due to subatmospheric environment, and the mechanisms underlying these clinical manifestations are examined. The environmental and individual factors affecting decompression sickness are studied. Postdecompression phenomena are examined, special attention being paid to severe and fatal postdescent shock, its etiology, and mechanism. Three classes of problems involving a differential diagnosis are discussed: (1) intercurrent illnesses which may coincidentally arise in association with flight, (2) physical and physiological disorders directly associated with flight at altitude, and (3) physiological reactions to such flight or laboratory simulations. A description of the treatment of decompression sickness is given, including the general measures, treatment of fat and air metabolism, compression therapy, and other therapeutic possibilities. Means by which gas supersaturation and bubble formation may be avoided are discussed, as well as means of reducing hazardous exposure and of detecting susceptible persons. The possibility of permanent defects following an ascent to altitude is examined. Z.W.

## A70-10516

## ANTIDIURETIC HORMONE AND EVAPORATIVE WEIGHT LOSS DURING HEAT STRESS.

L. C. Senay, Jr. and W. van Beaumont (St. Louis University, School of Medicine, Dept. of Physiology, St. Louis, Mo.).

*Pflügers Archiv*, vol. 312, no. 3, 1969, p. 82-90. 19 refs.

NIH Grants No. 5 RO1 HE-07075; No. 1K3 HE 25 110.

In order to investigate the effects of vasopressin (ADH) on evaporative weight loss during heat exposure, four modifications of a single experiment were used. In all experiments, the subjects initially

ingested an amount of tap water equal to 2 per cent of their body weight. During three out of four experiments, urinary and evaporative weight loss was replenished at 15-min intervals while no further water was ingested in the fourth experiment. Following a 2-hr period at room temperature, the subjects entered the heat chamber. Heat exposure for three experiments lasted 2 hr, while for a fourth exposure the time lapse was 4 hr. Vasopressin (5 units) was injected intramuscularly at the beginning of the last hour of heat exposure in two experiments wherein water replacement took place. Vasopressin injection had no apparent effect on rates of evaporative weight loss. For these experiments, the effects of exercise, hypohydration, and probably subject anxiety could be ruled out as influencing these results. (Author)

## A70-10518 #

## ELECTROCHEMICAL MECHANISMS OF THE GENERATION AND EXPANSION OF NERVOUS TENSION (ELEKTRO-KHIMICHESKIE MEKHAIZMY GENERATSII I RASPROSTRANENIIA NERVNOGO VOZBUZHDENIIA).

V. G. Levich, V. S. Markin, and Iu. A. Chizmadzhev.

*Akademiia Nauk SSSR, Vestnik*, vol. 39, Sept. 1969, p. 60-67. In Russian.

Investigation of the mechanism of neural impulse generation on the basis of a phenomenological method in neural impulse expansion theory. The approach is based on determining qualitative relations, comparing them with experimental data, and using the results to construct appropriate models. New approaches to the problem of ion transport, based on the use of artificial phospholipid membranes, are also examined. V.P.

## A70-10611 \* #

## APPLICATIONS OF BEHAVIORAL RESEARCH ON UNDERSEA HABITATS TO MANNED SPACE FLIGHT.

Nicholas Zill (Bellcomm, Inc., Life Sciences Group, Washington, D.C.), Stanley Deutsch, Edward J. McLaughlin, and Eugene S. Burcher (NASA, Washington, D.C.).

*American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display*, 6th, Anaheim, Calif., Oct. 20-24, 1969, Paper 69-1120. 9 p. 6 refs.

Members, \$1.00; nonmembers, \$1.50.

Contract No. NASw-417.

Discussion of the suitability of underwater saturation habitats as behavioral workshops to provide information for mission planning and human engineering of manned spaceflight. It is pointed out that such research can advance basic understanding of small group and motivational dynamics. The key elements provided by such habitats are shown to be: (1) the real hazards and natural confinement produced by the undersea environment and decompression constraints, and (2) the necessary and significant work to be done from and in such habitats. Preserving this motivational veracity requires an emphasis on multiple, noninterference measures of operational rather than artificial task performance. In Project Tektite, observations on four aquanauts for 60 days under the sea were made over closed-circuit TV and open microphones, and recorded by on-line card punching. The Tektite data demonstrate that a detailed and meaningful picture of crew performance can be derived from simple, objective behavioral records. P.G.

## A70-10615 #

## RENDEZVOUS IN SPACE AND HYDROSPACE—A COMPARISON.

P. P. Dogan (Massachusetts Institute of Technology, Instrumentation Laboratory, Cambridge, Mass.).

*American Institute of Aeronautics and Astronautics, Annual Meeting*

and Technical Display, 6th, Anaheim, Calif., Oct. 20-24, 1969, Paper 69-1102. 11 p. 6 refs.

Members, \$1.00; nonmembers, \$1.50.

Contract No. N 00024-67-C-0207.

Comparison of rendezvous missions in space or hydrospace by manned vehicles, requiring certain basic functions to take place concurrently. A functional structure is proposed which involves ship control, navigation, perception, communication, and prehension. The rendezvous comparison between a deep-sea rescue vehicle rejoining a mother submarine and a lunar excursion module rejoining a command module highlights the fact that a hydrospace vehicle interacts with its environment in a more disadvantageous way than does a spacecraft. Drag, visibility, and controllability conditions are more severe for submarines. Computer augmentation has been done on a large scale for both space and hydrospace craft. F.R.L.

#### A70-10644 \* #

##### USE OF MAN IN SPACE.

B. Howard and G. T. Orrok (Bellcomm, Inc., Space Sciences and Advanced Manned Missions Div., Washington, D.C.).

*American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 6th, Anaheim, Calif., Oct. 20-24, 1969, Paper 69-1045.* 9 p. 5 refs.

Members, \$1.00; nonmembers, \$1.50.

Contract No. NASw-417.

Attempt to set a generalized tradeoff between manned and automated systems, concentrating on criteria for the use of man and on the large range of man-hour costs. In a man-machine system, the important points are that man provides the objective, and an understanding of it. The displays must match his sensory channels, and the controls are matched to normally acquired adult motor skills. Specific examples and general guidelines are considered. The approach is to use a range of man-hour costs, pegged at the ends to systems which are reasonably understood. Specific examples of two potential scientific systems, lunar exploration and cosmic ray physics, are discussed, and, for each, the disciplinary background and objective are described abstractly. F.R.L.

#### A70-10651

##### ACID-BASE CHANGES OF ARTERIAL PLASMA DURING EXOGENOUS AND ENDOGENOUS HYPERCAPNIA IN MAN.

Kunio Ichiyangi, Kazunori Masuko, Naoki Nishisaka, Michiko Matsuki, Hideo Horikawa, and Reiko Watanabe (Niigata University, School of Medicine, Dept. of Anesthesiology, Niigata, Japan).

*Respiration Physiology*, vol. 7, Oct. 1969, p. 310-325. 28 refs.

Investigation of acid-base responses of anesthetized man to acute changes in carbon dioxide partial pressure produced exogenously and endogenously, and of the effects of general anesthesia on the nature of the carbon dioxide titration curve. Acute hypercapnic conditions were produced in man by exogenously given and endogenously accumulated carbon dioxide in order to compare the nature of the carbon dioxide titration curves of blood *in vivo* between these conditions. Effects of general anesthesia on these curves were also investigated. In the anesthetized subjects no significant difference was found between the slopes of the titration curves for these two modes of hypercapnia. Neither were the slopes of the curves for the unanesthetized subjects determined during exogenous hypercapnia greatly different from those of the anesthetized subjects. A clinical implication of these findings is that a carbon dioxide titration curve of blood defined in any of these conditions can be applied to other circumstances without serious error. Nonrespiratory acidosis did not occur during the hypercapnic period, while apparent nonrespiratory acidosis developed during the reversal of hypercapnia. Discrepancy in the length of time spent for the establishment and reversal of hypercapnia is thought responsible for the development of this apparent nonrespiratory acidosis. O.H.

#### A70-10652

##### DIRECT AND REBREATHING ESTIMATES OF THE O<sub>2</sub> AND CO<sub>2</sub> PRESSURES IN MIXED VENOUS BLOOD.

D. Denison, R. H. T. Edwards, G. Jones, and Helen Pope (Royal Postgraduate Medical School, Dept. of Medicine, London, England). *Respiration Physiology*, vol. 7, Oct. 1969, p. 326-334. 22 refs.

Research supported by the Medical Research Council.

Pulmonary artery blood was sampled from three subjects on 103 occasions before or during the rebreathing of carbon dioxide and nitrogen mixtures. Studies were made at rest and during three grades of exercise (150-900 kpm/min). The rebreathing estimate was consistently higher than that measured in blood, and the difference increased with exercise. One subject showed a similar difference in oxygen pressure. The rebreathing maneuver did not change the gas pressures measured in pulmonary artery blood. Differences in carbon dioxide pressure may be due to a change of the blood's carbon dioxide-transport characteristics within the pulmonary capillary, or to incomplete equilibration within mixed venous blood. (Author)

#### A70-10653

##### FLOW PATTERNS IN MODELS OF THE HUMAN BRONCHIAL AIRWAYS.

R. C. Schroter and M. F. Sudlow (London, University, Imperial College of Science and Technology, Physiological Flow Studies Unit, London, England).

*Respiration Physiology*, vol. 7, Oct. 1969, p. 341-355. 21 refs.

Research supported by the Tobacco Research Council and Asthma Research Council.

Flow profiles were studied in two successive generations of large scale symmetrical models of typical junctions of the human bronchial tree. Inspiratory and expiratory flows were investigated with either flat or parabolic profiles entering the first branch. Downstream, profiles were obtained in the plane of the bifurcation and normal to it. Flow patterns were visualized for the range of Reynolds numbers from 50 to 4500. Secondary motions were observed at all flow rates, their form depending upon direction of flow. Depending upon the curvature of the junction, flow separation with sluggish reversed flow could be observed in daughter tubes during inspiration. Inspiratory flow velocity profiles are highly asymmetric. In the plane of the junction, peak velocities swing to the inner walls. During expiration, velocity profiles normal to the junction plane become flat while profiles in the plane develop an axial peak. The results suggest that flow patterns are complex and parabolic flow cannot be assumed. (Author)

#### A70-10654

##### TIME DELAY TECHNIQUE IN RESPIRATORY INSTRUMENTATION.

Michael N. Leeming and William S. Howland (Memorial Hospital for Cancer and Allied Diseases, Dept. of Anesthesiology, New York, N.Y.).

*Respiration Physiology*, vol. 7, Oct. 1969, p. 399-402. 6 refs.

Description of an electronic sampling method used to delay the respiratory flow waveform in exact accord with transport delay which is inherent in many conventional high-speed gas analyzers. The system makes it possible for analog respiratory instrumentation computers to process data more accurately and with a minimum of expense. (Author)

#### A70-10707

##### PREVENTIVE EFFECTS OF NN' DIMETHYLGUANADINE ON THE DEVELOPMENT OF ATHEROSCLEROSIS INDUCED IN RABBITS BY CHOLESTEROL (EFFETS PREVENTIFS DU NN' DIMETHYLBIGUANIDE SUR LE DEVELOPPEMENT DE L'ATHEROSCLEROSE INDUITE PAR LE CHOLESTEROL CHEZ LE LAPIN).

René Agid and Georges Marquié (Toulouse, Université, Institut de Physiologie, Toulouse, France).

*Académie des Sciences (Paris), Comptes Rendus, Série D—Sciences Naturelles*, vol. 269, no. 11, Sept. 15, 1969, p. 1000-1003. In French.

Demonstration that the administration of NN' dimethylguanidine, an antidiabetic substance, greatly inhibits the arterial lesions induced by the administration of cholesterol in rabbits. It is shown that this favorable effect is not limited to the circulation of lipids and is relatively important in preventing the atherosclerotic syndrome. Among a quarter of the animals whose lipidic troubles were not at all affected by biguanidine, and which as a result presented hyperlipemia, a significant reduction of arterial lesions was noticed.

F.R.L.

#### A70-10708

##### DISTRIBUTION OF HISTAMINE IN THE BRAIN OF THE RAT (REPARTITION DE L'HISTAMINE DANS LE CERVEAU DU RAT).

Jacques-Robert Boissier, Michel Guernet, Jean-Paul Tillement, Isaac Blanco, and Margarita Blanco (Institut National de la Santé et de la Recherche Médicale, Unité de Neuropsychopharmacologie, Paris, France).

*Académie des Sciences (Paris), Comptes Rendus, Série D—Sciences Naturelles*, vol. 269, no. 9, Sept. 1, 1969, p. 929, 930. 10 refs. In French.

Study of whether or not cerebral histamine is uniformly distributed in the brain of rats. With the help of a method described by Boissier et al. (1969), it was determined that histamine distribution is 40.8 per cent in the cortex, 19 per cent in the hypothalamus, 16 per cent in the thalamus, 5.5 per cent in the cerebellum, 5 per cent in the hippocampus, and 2.4 per cent in the medulla oblongata. The highest concentrations were observed in the hypothalamus and the thalamus.

F.R.L.

#### A70-10709

##### STUDY AND PHYSIOLOGICAL INTERPRETATION OF THE RIGHT INTRACARDIAC BLOOD VELOCITY CURVES RECORDED BY AN ULTRASONIC DIRECTIONAL PROBE USING THE DOPPLER EFFECT (ETUDE ET INTERPRETATION PHYSIOLOGIQUE DES COURBES DE VELOCITE SANGUINE INTRA-CARDIAQUE DROITE ENREGISTREES PAR SONDE ULTRASONIQUE DIRECTIONNELLE A EFFET DOPPLER).

Daniel Kalmanson, Nicolas Novikoff, Paul Chiche, and Claude Deral (Fondation Ophtalmologique A-de-Rothschild, Service de Cardiologie, Paris, France).

*Académie des Sciences (Paris), Comptes Rendus, Série D—Sciences Naturelles*, vol. 269, no. 12, Sept. 22, 1969, p. 1097-1100. 6 refs. In French.

Analysis of the blood velocity curves recorded in the right heart cavities of seven normal dogs by means of an ultrasonic probe. It is found that the recorded curves are characteristic for specific points in the right atrium and right ventricle, and are directly related to the mechanism of the cardiac contraction of the right part of the heart.

Z.W.

#### A70-10714

##### AIRCREW ESCAPE/RESCUE CAPABILITY (AERCAB)—THE FLYING EJECTION SEAT.

William A. Mawhinney (U.S. Navy, Naval Air Development Center, Johnsville, Pa.).

*Safe Engineering*, vol. 3, Aug.-Sept. 1969, p. 25-29.

The intention of the AERCAB program is to improve the recovery rate of downed aircrewmembers by providing them with the capability of flying away from their damaged aircraft. The aircraft ejection seat is equipped with deployable lifting surfaces and a

propulsion source, thus creating a "flying ejection seat." It is required that the vehicle be able to maintain a velocity of 100 knots for at least 30 minutes. Numerous AERCAB concepts have been proposed. The Navy is currently investigating concepts in the rotary wing and fixed wing categories, and the Air Force is evaluating a parawing concept. It is intended that, after the completion of feasibility studies and test programs, one AERCAB concept will be selected for joint-services development.

(Author)

#### A70-10716

##### EMERGENCY EVACUATION TESTS OF THE C-9A AERO-MEDICAL AIRCRAFT.

Burton P. Chesterfield (USAF, Aeronautical Systems Div., Wright-Patterson AFB, Ohio).

*Safe Engineering*, vol. 3, Aug.-Sept. 1969, p. 36-48, 9 refs.

Description of tests conducted to gather technical data needed to evaluate the ground and ditching characteristics of the C-9A aeromedical aircraft. An important secondary benefit realized from these tests was the development of better medical training procedures for handling the wounded during ground and ditching emergencies. The C-9A aircraft was used in the tests which were conducted under cover of darkness to simulate the worst possible survivable crash condition—that of darkness or fire and smoke. Six tests were made, using a different combination of exits each time. Exits that would be available during a survivable ground crash were used during five of the tests, and exits available during a water ditching were used during the sixth test. The C-9A has seven exits available, but the assumption that half the exits were blocked permitted the use of no more than three exits at a time. The exception to this rule was the ditching test in which the aircraft was assumed to have ditched at sea and come to rest, floating at wing level, with all four overwing exits available for use. The average evacuation time was 128 sec, which is 68 sec more than permitted by current standards.

(Author)

#### A70-10717

##### SPACE RESCUE.

Gloria W. Heath (SAR-Assist, Inc., Greenwich, Conn.).

*Safe Engineering*, vol. 3, Aug.-Sept. 1969, p. 55-58, 8 refs.

Description of the recovery techniques and equipment utilized in current missions, generally applicable to the NASA recovery program as of December 1968. Consideration is limited to contingency return from low-earth orbit and to water landing, and does not include response to launch or boost abort or land landing. Launch abort presents perhaps the most critical rescue situation, in that large quantities of hypergolic fuel may be released in close proximity to populated areas. In view of the immediate response required, it is considered a function closely related to launch operations. Water landing (ten foot minimum depth) has been selected by NASA for the reason that landing problems, such as obstacle avoidance capability and landing force attenuation, are largely avoided in this mode. Land landing would involve a great many other considerations, some of which are presented in the discussion of future contingency planning.

(Author)

#### A70-10718

##### SCID-OPERATED AIRCRAFT SEAT EJECTION SYSTEMS.

Robert C. Allen and Robert M. Lawrence (Teledyne, Inc., McCormick Selph Div., Hollister, Calif.).

*Safe Engineering*, vol. 3, Aug.-Sept. 1969, p. 68-71.

Discussion of aircraft seat ejection systems using the SCID (Small Column Insulated Delay) distribution system, which takes advantage of the standard end devices in conventional systems, yet greatly reduces the overall weight of the total system. SCID consists

of a thin continuous column of deflagrating pyrotechnic encased in a protective metal jacket with suitable external insulation. The system consists essentially in replacing all high-pressure tubing, initiators, valves, manifolds, and fittings with SCID components, yet retaining and retrofitting with previously qualified standard end-functioning devices.  
F.R.L.

## A70-10719

## BEACONS—COST VS SURVIVAL.

Richard G. Dougherty.

*Safe Engineering*, vol. 3, Aug.-Sept. 1969, p. 73, 74.

Discussion of the use of downed aircraft locator beacon equipment as a means of speeding up location of a crashed or force-landed aircraft, thus increasing possibilities of survival, and reducing the cost of a search. Various such devices are described, and they are shown to be relatively inexpensive considering their very great value. The value of beacons was demonstrated in a simulated search. The signal was immediately detected, and the search aircraft was over the scene in ten minutes.  
F.R.L.

## A70-10724

## SIZE ADAPTATION—A NEW AFTEREFFECT.

Colin Blakemore and Peter Sutton (Cambridge University, Physiological Laboratory, Cambridge, England).

*Science*, vol. 166, Oct. 10, 1969, p. 245-247. 12 refs.

Medical Research Council Grant No. G 968/190/B.

If, after prolonged observation of a striped pattern, the subject views a grating of the same orientation with somewhat narrower bars, then the bars seem even thinner than in fact they are. Broader bars seem broader still. This finding implies a system of size-detecting channels in human vision. The phenomenon may underline many of the classical figural aftereffects.  
(Author)

## A70-10725

## BEHAVIORAL REGULATION OF HYPOTHALAMIC TEMPERATURE.

John D. Corbit (Brown University, Walter S. Hunter Laboratory of Psychology, Providence, R.I.).

*Science*, vol. 166, Oct. 10, 1969, p. 256-258. 19 refs.

NIH Grant No. MH-16608.

Animals will work to produce changes in hypothalamic temperature. The two main inputs, skin and hypothalamic temperatures, combine to control this behavior. Specifically, the rate at which rats work for changes in hypothalamic temperature is proportional to the sum of the weighted displacements of skin and hypothalamic temperatures from their respective neutral values.  
(Author)

## A70-10787 \*

CONTROL OF MIXED-SUBSTRATE UTILIZATION IN CONTINUOUS CULTURES OF *ESCHERICHIA COLI*.

Richard S. Silver and Richard I. Mateles (Massachusetts Institute of Technology, Dept. of Nutrition and Food Science, Cambridge, Mass.).

*Journal of Bacteriology*, vol. 97, Feb. 1969, p. 535-543. 40 refs.

Grant No. NSG-496.

Use of the chemostat culture technique to study the control mechanisms which operate during utilization of mixtures of glucose

and lactose and glucose and L-aspartic acid by populations of *Escherichia coli* B6. Constitutive mutants were rapidly selected during continuous culture on a mixture of glucose and lactose, and the beta-galactosidase level of the culture increased greatly. After mutant selection, the specific beta-galactosidase level of the culture was a decreasing function of growth rate. In cultures of both the inducible wild type and the constitutive mutant, glucose and lactose were simultaneously utilized at moderate growth rates, whereas only glucose was used in the inducible cultures at high growth rates. Catabolite repression was shown to be the primary mechanism of control of beta-galactosidase level and lactose utilization in continuous culture on mixed substrates. In batch culture, as in the chemostat, catabolite repression acting by itself on the *lac* enzymes was insufficient to prevent lactose utilization or cause diauxie. Interference with induction of the *lac* operon, as well as catabolite repression, was necessary to produce diauxic growth. Continuous cultures fed mixtures of glucose and L-aspartic acid utilized both substrates at moderate growth rates, even though the catabolic enzyme aspartase was linearly repressed with increasing growth rate. Although the repression of aspartase paralleled the catabolite repression of beta-galactosidase, L-aspartic acid could be utilized even at very low levels of the catabolic enzyme because of direct anabolic incorporation into protein.  
(Author)

## A70-10788 \*

ASSIMILATION AND METABOLISM OF EXOGENOUS ORGANIC COMPOUNDS BY THE STRICT AUTOTROPHS *THIOBACILLUS THIOPARUS* AND *THIOBACILLUS NEAPOLITANUS*.

Emmett J. Johnson and S. Abraham (Northern California, Children's Hospital Medical Center, Bruce Lyon Memorial Research Laboratory, Oakland, Calif.).

*Journal of Bacteriology*, vol. 97, Mar. 1969, p. 1198-1208. 18 refs.

Contract No. NAS 2-3901.

Investigation of the metabolic capabilities and pathways of obligate autotrophs with respect to externally provided organic nutrients. The assimilation and utilization of the individual carbon atoms of pyruvate and acetate by cells of *Thiobacillus thioparus* and *T. neapolitanus*, in the presence and absence of an energy source, were studied by use of radioactive substrates. The results obtained, which show the difference in the metabolism of these two species of *Thiobacillus*, are discussed in relation to the biochemical basis of chemoautotrophy.  
P.G.

## A70-10789 \*

## BIOCHEMICAL STUDIES OF BACTERIAL SPORULATION AND GERMINATION. XIII.

James A. Spudich and Arthur Kornberg (Stanford University, School of Medicine, Dept. of Biochemistry, Stanford, Calif.).

*Journal of Bacteriology*, vol. 98, Apr. 1969, p. 69-74. 23 refs.

NIH-NSF-NASA-supported research.

Study of the spore and vegetative cell adenylate kinases of *Bacillus subtilis*, which proved indistinguishable by several physical and functional tests, including polyacrylamide gel electrophoresis, DEAE cellulose chromatography, and specificity toward substrates. Adenylate kinase activity in cell extracts, followed throughout growth and sporulation, was found to reach a maximum near the end of exponential growth, remain at that level during sporulation, until shortly before the appearance of refractile forms, and then decline, along with total protein, during the subsequent maturation of the spores. The enzyme, stable in extracts of exponential growing cells, was unstable in extracts of sporulating cells, presumably as a result of degradation by protease(s) appearing after the end of exponential growth.  
(Author)

## A70-10790

**RELATIONSHIP BETWEEN GLUCOSE UTILIZATION AND GROWTH RATE IN BACILLUS SUBTILIS.**

J. Baschnagel-DePamphilis and R. S. Hanson (Wisconsin, University, Dept. of Bacteriology, Madison, Wis.).

*Journal of Bacteriology*, vol. 98, Apr. 1969, p. 222-225. 11 refs.

Research supported by the American Cancer Society.

The effect of growth rate on the rate of glucose utilization has been examined with a sporogenic and a weakly sporogenic strain of *Bacillus subtilis* by means of the continuous culture technique. Cultures were grown aerobically on a mineral salts medium with glucose as the source of carbon and energy. During both nitrogen and L-tryptophan limitation, the rate of glucose consumption (milligrams of glucose per hour per milligrams of cells) decreased when the growth rate was decreased. The coupling between the rate of glucose disappearance and the growth rate was estimated as 76 to 86 per cent during nitrogen limitation and as 60 to 78 per cent during tryptophan limitation. Sporulation had no detectable influence on the coupling. (Author)

## A70-10791 \*

**FATTY ACIDS AND POLAR LIPIDS OF EXTREMELY THERMOPHILIC FILAMENTOUS BACTERIAL MASSES FROM TWO YELLOWSTONE HOT SPRINGS.**

A. J. Bauman and Peter G. Simmonds (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.).

*Journal of Bacteriology*, vol. 98, May 1969, p. 528-531. 25 refs.

Study of fatty acids and polar lipids of extremely thermophilic filamentous bacterial masses from two very hot Yellowstone Park springs, using gas chromatography. It is found that the fatty acid pattern of this anomalous group of organisms is like that of normal bacteria but not of blue-green algae. Both populations have similar polar lipids and identical carotenoids. It is speculated that these organisms may be adapted to their high-temperature environment by means of stable lipoprotein membrane systems. Z.W.

## A70-10792 \*

**PURIFICATION AND REVERSIBLE INACTIVATION OF THE ISOCITRATE DEHYDROGENASE FROM AN OBLIGATE HALOPHILE.**

Jerry S. Hubbard and Alan B. Miller (California Institute of Technology, Jet Propulsion Laboratory, Bioscience Section, Pasadena, Calif.).

*Journal of Bacteriology*, vol. 99, July 1969, p. 161-168. 16 refs.

Study of the purification and reversible inactivation of the nicotinamide adenine dinucleotide phosphate (NADP)-specific isocitrate dehydrogenase (ICDH) of *Halobacterium cutirubrum*. A method for purification of this ICDH is described which overcomes the existing difficulties in purifying the halophilic enzymes. In addition, a comparison is made of certain physical properties of the active and inactive forms of the halophilic ICDH. O.H.

## A70-10793

**EFFECTS OF INSTRUCTIONS AND REINFORCEMENT-FEEDBACK ON HUMAN OPERANT BEHAVIOR MAINTAINED BY FIXED-INTERVAL REINFORCEMENT.**

Alan Baron, Arnold Kaufman, and Kathleen A. Stauber (Wisconsin, University, Milwaukee, Wis.).

*Journal of the Experimental Analysis of Behavior*, vol. 12, Sept. 1969, p. 701-712. 14 refs.

NSF Grants No. GB-4004; No. GB-8234.

In three experiments, human subjects were trained on a five-component multiple schedule with different fixed intervals of monetary reinforcement scheduled in the different components. Subjects uninstructed about the fixed-interval schedules manifested

high and generally equivalent rates regardless of the particular component. By comparison, subjects given instructions about the schedules showed orderly progressions of rates and temporal patterning as a function of the interreinforcement intervals, particularly when feedback about reinforcement was delivered but also when reinforcement-feedback was withheld. Administration of the instructions-reinforcement combination to subjects who had already developed poorly differentiated behavior, however, did not make their behavior substantially better differentiated. When cost was imposed for responding, both instructed and uninstructed subjects showed low and differentiated rates regardless of their prior histories. It is concluded that instructions can have major influences on the establishment and maintenance of human operant behavior. (Author)

## A70-10794 \*

**GENERALIZATION OF CONDITIONED SUPPRESSION AFTER DIFFERENTIAL TRAINING.**

Derek P. Hendry (Illinois, University, Chicago, Ill.), Richard Switalski (Maryland, University, College Park, Md.), and Matthew Yarczower (Bryn Mawr College, Bryn Mawr, Pa.).

*Journal of the Experimental Analysis of Behavior*, vol. 12, Sept. 1969, p. 799-806. 14 refs.

NIH Grants No. MH 08819-01; GM-14221; Grant No. NSG-189-61.

In a modified conditioned suppression procedure, clicks at one frequency (danger signal) preceded shocks, while no shocks followed clicks at a different frequency (safe signal). During generalization tests, the maximal response rate was frequently shifted from the safe signal in the direction away from the danger signal, and the minimal response rate was frequently shifted in the opposite direction, away from the safe signal. There was considerable variability in the results from one animal to another. The generalization tests also suggested different generalization functions according to whether the danger signal was a lower or a higher frequency than the safe signal. The results also showed the development of systematic differences in response rate during and after the safe and danger signals, notably a relatively high rate at the beginning of the safe signal and after the danger signal. (Author)

## A70-10796 \*

**DETERMINATION OF SELECTIVE STIMULUS CONTROL BY PART OF A COMPOUND SΔ.**

Daniel F. Johnson, Bill N. Kinder, and Glenn N. Scarboro (Virginia Polytechnic Institute, Blacksburg, Va.).

*Psychonomic Science*, vol. 17, Oct. 10, 1969, p. 7, 8. 7 refs.

PHS Grant No. MH-13383; Grant No. NGR-47-004-006.

Study of the selective stimulus control determined in eight White Carneau and White King cock pigeons following a test training procedure to which the pigeons had been subjected. This test procedure consisted first in training the pigeons to peck at each of the following stimuli presented alone: a white vertical line, a white horizontal line, a red background, or a green background. Then each pigeon was given ten sessions of single-stimulus discrimination training and five sessions of compound stimulus discrimination training with these stimuli. Vertical line and green background were always S<sup>D</sup> components, while horizontal line and red background were always S<sup>Δ</sup> components. In generalization tests, when all four stimuli were again presented alone, nonresponding was selectively controlled by the single-stimulus discrimination training, S<sup>Δ</sup>, regardless of training sequence. The proportions of total responding in the two test sessions to the four stimuli for each tested subject are presented graphically. The results suggest that an active stimulus selection mechanism should be applied to negative, as well as positive, compound training stimuli. O.H.

A70-10809

**SOME POSSIBLE EFFECTS OF DEGRADED IMAGE QUALITY ON HUMAN PERFORMANCE IN SIMULATION.**

Thomas J. Triggs (Hughes Aircraft Co., Aerospace Group, Culver City, Calif.).

IN: PHOTO-OPTICAL TECHNIQUES IN SIMULATORS; SOCIETY OF PHOTO-OPTICAL INSTRUMENTATION ENGINEERS, SEMINAR-IN-DEPTH, SOUTH FALLSBURG, N.Y., APRIL 28, 29, 1969, PROCEEDINGS. (A70-10807 01-11)

Seminar co-sponsored by the Simulation Councils.

Redondo Beach, Calif., Society of Photo-optical Instrumentation Engineers (SPIE Seminar Proceedings. Volume 17), 1969, p. 21-25. 16 refs.

Review of some of the factors which determine relative performance decrements in complex system simulation involving humans. Time-sharing strategies and factors of task difficulty in time-sharing performance are discussed. Under time-sharing conditions, the additional task demonstrated a determination in performance level as the display gain increased, thereby indicating a shift in emphasis toward the tracking task. It is suggested that caution should be exercised in determining relative task performance in simulators with low display fidelity. Furthermore, the interaction between task-induced stress and the use of subtle display features also emphasizes the importance of display fidelity for performance evaluation in simulators. M.M.

A70-10813

**FUNDAMENTAL LIMITATIONS IN VISUAL SIMULATION.**

William C. Ebeling (Singer Co., Link Div., New York, N.Y.).

IN: PHOTO-OPTICAL TECHNIQUES IN SIMULATORS; SOCIETY OF PHOTO-OPTICAL INSTRUMENTATION ENGINEERS, SEMINAR-IN-DEPTH, SOUTH FALLSBURG, N.Y., APRIL 28, 29, 1969, PROCEEDINGS. (A70-10807 01-11)

Seminar co-sponsored by the Simulation Councils.

Redondo Beach, Calif., Society of Photo-optical Instrumentation Engineers (SPIE Seminar Proceedings. Volume 17), 1969, p. 79-90.

Comparison between basic approaches and existing limitations in the implementation of various reflective schemes to correct the parallax error in simple display systems for visual simulators. Future expansion required to permit the heretofore unattained wraparound system is analyzed. Image generation is explored, beginning with the applications of closed-circuit TV. Limitations in the state of the art of the medium of transmission itself are examined, together with the limitations in various applications which are imposed by fundamental optical problems or limitations in the storage medium. Image generation systems that do not rely on closed-circuit TV are considered, together with motion-picture film systems that employ distortion techniques to provide translational freedom. Holographic image generation systems are discussed from a fundamental standpoint. M.M.

A70-10820

**PSYCHOLOGICAL REQUIREMENTS IN PHOTO-OPTICAL SYSTEMS IN SIMULATION.**

Kiyoe Mizusawa (Pennsylvania State University, University Park, Pa.).

IN: PHOTO-OPTICAL TECHNIQUES IN SIMULATORS; SOCIETY OF PHOTO-OPTICAL INSTRUMENTATION ENGINEERS, SEMINAR-IN-DEPTH, SOUTH FALLSBURG, N.Y., APRIL 28, 29, 1969, PROCEEDINGS. (A70-10807 01-11)

Seminar co-sponsored by the Simulation Councils.

Redondo Beach, Calif., Society of Photo-Optical Instrumentation Engineers (SPIE Seminar Proceedings. Volume 17), 1969, p. 145-148. 6 refs.

Measurement of the retinal gradient of the critical fusion

frequency over larger portions of retina in order to estimate the sensitivity to motion perception. The visual angles of 0 deg (at fovea), 3 deg 16 min, 6 deg 51 min, 13 deg 30 min, and 25 deg 39 min were measured, along with nasal, temporal, inferior, superior, and both diagonal coordinates of the retina. The experimental results indicate that the higher frequencies are shown in the central fovea region, and that the lower frequencies are shown in the peripheral region along with eight coordinates. M.M.

A70-10821

**PSYCHOLOGICAL ERRORS IN PHOTO-OPTICAL SYSTEMS OF SIMULATION.**

Kiyoe Mizusawa (Pennsylvania State University, University Park, Pa.).

IN: PHOTO-OPTICAL TECHNIQUES IN SIMULATORS; SOCIETY OF PHOTO-OPTICAL INSTRUMENTATION ENGINEERS, SEMINAR-IN-DEPTH, SOUTH FALLSBURG, N.Y., APRIL 28, 29, 1969, PROCEEDINGS. (A70-10807 01-11)

Seminar co-sponsored by the Simulation Councils.

Redondo Beach, Calif., Society of Photo-optical Instrumentation Engineers (SPIE Seminar Proceedings. Volume 17), 1969, p. 149-153. 18 refs.

Brief discussion of some of the psychological aspects of the sources of unreliability in man-machine systems. Criteria for the selection and training of users of photooptical instruments are discussed. Three major variables affecting the motivational perceptual processes—namely, needs and values, reward and punishment, and personality differences—are discussed. M.M.

A70-10822

**BIOSATELLITE III—PRELIMINARY FINDINGS.**

W. R. Adey (California, University, Dept. of Anatomy and Dept. of Physiology, Los Angeles, Calif.), A. T. K. Cockett (Rochester, University, School of Medicine, Div. of Urology, Rochester, N.Y.), P. B. Mack (Texas Woman's University, Denton, Tex.), J. P. Meehan (Southern California, University, School of Medicine, Dept. of Physiology, Los Angeles, Calif.), and N. Pace (California, University, Dept. of Physiology and Anatomy, Berkeley, Calif.).

*Science*, vol. 166, Oct. 24, 1969, p. 492, 493.

Physiological deterioration in the male macaque monkey flown in Biosatellite III necessitated its recall after 8.5 days of a planned 30-day flight. For the first 7 days the only telemetered signs of a progressive general decline were falling brain temperature and lowered central venous pressure, which occurred in the last 3 days of flight. Fluid loss in flight was high, caused initially by sweating and later by diuresis, and appeared to arise in redistribution of blood in visceral pools as a consequence of weightlessness. Death occurred suddenly 12 hours after the flight and was caused by ventricular fibrillation. (Author)

A70-10824 \*

**CYCLIC ADENOSINE MONOPHOSPHATE—STIMULATION OF MELATONIN AND SEROTONIN SYNTHESIS IN CULTURED RAT PINEALS.**

Harvey M. Shein (McLean Hospital, Research Laboratory, Belmont; Harvard University, Harvard Medical School, Dept. of Psychiatry, Boston, Mass.) and Richard J. Wurtman (Massachusetts Institute of Technology, Dept. of Nutrition and Food Science, Cambridge, Mass.).

*Science*, vol. 166, Oct. 24, 1969, p. 519, 520. 12 refs.

NIH Grants No. NB-06610; No. AM-11709; Grant No. NGR-22-009-272.

Dibutyl cyclic adenosine monophosphate, like norepinephrine, stimulates the synthesis of labeled melatonin and serotonin

from tryptophan labeled with carbon-14 by rat pineals in organ culture. Unlike norepinephrine, dibutyl cyclic adenosine monophosphate does not enhance the accumulation of labeled tryptophan or protein within the pineal. These findings are compatible with the hypothesis that cyclic adenosine monophosphate mediates some, but not all, of the effects of norepinephrine. (Author)

## A70-10853 #

## CREW LOCOMOTION DISTURBANCES IN A SPACE CABIN SIMULATOR.

M. Goodman and W. C. Middleton (McDonnell Douglas Corp., McDonnell Douglas Astronautics Co., Western Div., Santa Monica, Calif.).

*Journal of Spacecraft and Rockets*, vol. 6, Oct. 1969, p. 1207-1209.

Discussion of some data on the locomotion of four crewmen during six separate 24-hr periods of a 60-day continuous test in the Space Cabin Simulator (SCS). Six photoelectric relays and their associated light sources were installed within the SCS for this purpose. When a light beam was interrupted, one of six pens in an event recorder was activated. The cylindrical SCS, 12 ft in diameter and 40 ft long, contained the basic components of a life support system and hence simulated the geometry of a typical space station.

G.R.

## A70-10855

## OCCUPATIONAL AND MEDICATIVE HAZARDS IN OPHTHALMOLOGY; EUROPEAN SOCIETY OF OPHTHALMOLOGY, CONGRESS, 3RD, AMSTERDAM, NETHERLANDS, JUNE 18-21, 1968, PROCEEDINGS.

Edited by J. François (European Society of Ophthalmology, Ghent, Belgium).

Basel, Switzerland, S. Karger AG, 1969. 738 p. In English, German, and French. \$36.

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VISUAL ATTENTION—ITS MEASUREMENT AND ITS MAINTENANCE (L'ATTENTION VISUELLE—SA MESURE ET SON MAINTIEN). M. Pottier, A. Laville, F. Lille, and J. Scherrer (Centre National de la Recherche Scientifique, Paris, France), p. 384-389. 6 refs. (See A70-10861 01-04)

VISUAL LOAD. G. J. Fortuin (Philips' Gloeilampenfabrieken, Eindhoven, Netherlands), p. 404-409. (See A70-10862 01-04)

THE EFFECTS OF OXYGEN ON RETINAL CIRCULATION. P. S. Ramalho and C. T. Dollery (Hospital Santa Maria, Lisbon, Portugal), p. 506-512. 12 refs. (See A70-10863 01-04)

LIST OF PARTICIPANTS, p. 705-723.

## A70-10856

## ULTRAVIOLET AND SOLAR RADIATION (ULTRAVIOLETTE UND SONNENSTRAHLUNG).

K. Heinz (Innsbruck, Universität, Augenklinik, Innsbruck, Austria).

IN: OCCUPATIONAL AND MEDICATIVE HAZARDS IN OPHTHALMOLOGY; EUROPEAN SOCIETY OF OPHTHALMOLOGY, CONGRESS, 3RD, AMSTERDAM, NETHERLANDS, JUNE 18-21, 1968, PROCEEDINGS. (A70-10855 01-04)

Edited by J. François.

Basel, Switzerland, S. Karger AG, 1969, p. 75-94. 17 refs. In German.

Review of the present state of knowledge regarding the changes of tissue proteins under the influence of visible light rays and ultraviolet rays. It has been found that denaturation occurs as a result of changes in the chemical bonds causing changes in the protein configuration, which eventually manifest themselves in clinical disease patterns. Some examples are presented, showing the genesis, prophylaxis, and treatment of these disease patterns. G.R.

## A70-10857

## VISUAL FATIGUE (LA FATIGUE VISUELLE).

A. Dubois-Poulsen.

IN: OCCUPATIONAL AND MEDICATIVE HAZARDS IN OPHTHALMOLOGY; EUROPEAN SOCIETY OF OPHTHALMOLOGY, CONGRESS, 3RD, AMSTERDAM, NETHERLANDS, JUNE 18-21, 1968, PROCEEDINGS. (A70-10855 01-04)

Edited by J. François.

Basel, Switzerland, S. Karger AG, 1969, p. 157-180. 133 refs. In French.

Discussion of visual fatigue, its symptoms, causes, its relation to general fatigue, and its psychological aspects. Visual fatigue is an important factor in industry and in ordinary life. Its knowledge affects illumination techniques. Visual fatigue can be easily recognized at the ocular muscle, but sensory fatigue is difficult to demonstrate. Output and performance tests demonstrating modification of behavior remain the most trustworthy. The causes of fatigue are legion, the psychological factor is very important, and individual characteristics determine its appearance. It is of fundamental importance to take account of the psychosomatic nature of fatigue for proper diagnosis and treatment. G.R.

## A70-10858

## PROFESSIONAL OPHTHALMIC AFFLICTIONS RELATED TO FLIGHTS IN THE ATMOSPHERE OR IN SPACE (MALADIES PROFESSIONNELLES OCULAIRES EN RAPPORT AVEC LES VOLS ATMOSPHERIQUES ET SPATIAUX).

A. Grignolo (Genova, Università, Clinica Oculistica, Genoa, Italy) and A. Scano (Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome, Italy).

IN: OCCUPATIONAL AND MEDICATIVE HAZARDS IN OPHTHALMOLOGY; EUROPEAN SOCIETY OF OPHTHALMOLOGY, CONGRESS, 3RD, AMSTERDAM, NETHERLANDS, JUNE 18-21, 1968, PROCEEDINGS. (A70-10855 01-04)

Edited by J. François.

Basel, Switzerland, S. Karger AG, 1969, p. 191-207. 61 refs. In French.

Discussion of ophthalmic lesions caused or aggravated by flight. It is found that occasionally a severe fall in barometric pressure may cause retinal hemorrhages. Rapid acceleration and deceleration may cause retinal and conjunctival hemorrhages and, in exceptional cases, detachment of the retina in predisposed subjects. Palpebral and conjunctival lesions may arise from wind pressure on ejection from an aircraft. Lids and cornea may be damaged by cold, heat, or by irritant vapors following accidents. Conditions accompanying prolonged flight—such as dazzle, repeated moderate hypoxia, and space myopia—have caused a reduction in visual acuity especially in older pilots. G.R.



## A70-10859

## THE HAZARDOUS EFFECTS OF LASER RADIATION ON THE EYE.

B. Tengroth (Göteborg, University, Sahlgren Hospital, Dept. of Ophthalmology, Göteborg, Sweden).

IN: OCCUPATIONAL AND MEDICATIVE HAZARDS IN OPHTHALMOLOGY; EUROPEAN SOCIETY OF OPHTHALMOLOGY, CONGRESS, 3RD, AMSTERDAM, NETHERLANDS, JUNE 18-21, 1968, PROCEEDINGS. (A70-10855 01-04)

Edited by J. François.

Basel, Switzerland, S. Karger AG, 1969, p. 338-342. 9 refs.

Discussion of the present state of knowledge concerning the effect of laser radiation on the eye. Investigations conducted for the purpose of developing safety regulations are mentioned. Other studies were started in order to quantify the amount of light necessary to cause coagulation for retinal detachment surgery. The transmission of laser light through the optical media of the eye is considered. It is found that very little is known about the character of some physical phenomena connected with high photon densities and what they actually mean in biological tissues. It is concluded that, because of the present lack of knowledge in the laser field, it is difficult to defend the use of the laser in surgery. G.R.

## A70-10860

## ALTERATIONS IN MUCOPOLYSACCHARIDE-COMPOUNDS OF TEAR AND THAT OF CORNEA'S EPITHELIUM, CAUSED BY ULTRAVIOLET RADIATION.

I. Tapasztó (Hungarian Military Forces, Health Service) and Z. Vass (Szeged, University, Ophthalmological Clinic, Hungary).

IN: OCCUPATIONAL AND MEDICATIVE HAZARDS IN OPHTHALMOLOGY; EUROPEAN SOCIETY OF OPHTHALMOLOGY, CONGRESS, 3RD, AMSTERDAM, NETHERLANDS, JUNE 18-21, 1968, PROCEEDINGS. (A70-10855 01-04)

Edited by J. François.

Basel, Switzerland, S. Karger AG, 1969, p. 343-347. 7 refs.

Study of the effect of ultraviolet radiation from a low-pressure mercury vapor lamp on mucopolysaccharide compounds in tears and on the epithelium of the cornea of Canadian albino rabbits. It was found that, in the first stage, this effect takes the form of a decrease in the amount of mucopolysaccharides and other components of tears. Later, there is a breakdown in the mucopolysaccharides of the cornea. G.R.

## A70-10861

## VISUAL ATTENTION—ITS MEASUREMENT AND ITS MAINTENANCE (L'ATTENTION VISUELLE—SA MESURE ET SON MAINTIEN).

M. Pottier, A. Laville, F. Lille, and J. Scherrer (Centre National de la Recherche Scientifique, Laboratoire de Physiologie du Travail, Paris, France).

IN: OCCUPATIONAL AND MEDICATIVE HAZARDS IN OPHTHALMOLOGY; EUROPEAN SOCIETY OF OPHTHALMOLOGY, CONGRESS, 3RD, AMSTERDAM, NETHERLANDS, JUNE 18-21, 1968, PROCEEDINGS. (A70-10855 01-04)

Edited by J. François.

Basel, Switzerland, S. Karger AG, 1969, p. 384-389. 6 refs. In French.

Study of visual attention on the basis of experimental tests of two types. One type is concerned with the focusing of perception on a stimulus object and the recording of eyelid blinking, or with the measurement of the distance from the eyes to the work plane in tasks requiring speed and accuracy. The second type of investigations bears not only on the phenomenon of visual focusing on the basis of behavioral variables but also on the central nervous activity elicited by the attention processes, as determined by such means as EEGs. G.R.

## A70-10862

## VISUAL LOAD.

G. J. Fortuin (Philips' Gloeilampenfabrieken, Eindhoven, Netherlands).

IN: OCCUPATIONAL AND MEDICATIVE HAZARDS IN OPHTHALMOLOGY; EUROPEAN SOCIETY OF OPHTHALMOLOGY, CONGRESS, 3RD, AMSTERDAM, NETHERLANDS, JUNE 18-21, 1968, PROCEEDINGS. (A70-10855 01-04)

Edited by J. François.

Basel, Switzerland, S. Karger AG, 1969, p. 404-409.

Discussion of approaches to testing the visual faculties of subjects and of ways to improve performance in visual inspection tasks. The concept of the threshold line is considered, and the relation of visual performance to the age of the subject is discussed. It is shown how various possibilities of improving the visual situation in an inspection task can be derived. G.R.

## A70-10863

## THE EFFECTS OF OXYGEN ON RETINAL CIRCULATION.

P. S. Ramalho and C. T. Dollery (Hospital Santa Maria, Dept. of Ophthalmology, Lisbon, Portugal).

IN: OCCUPATIONAL AND MEDICATIVE HAZARDS IN OPHTHALMOLOGY; EUROPEAN SOCIETY OF OPHTHALMOLOGY, CONGRESS, 3RD, AMSTERDAM, NETHERLANDS, JUNE 18-21, 1968, PROCEEDINGS. (A70-10855 01-04)

Edited by J. François.

Basel, Switzerland, S. Karger AG, 1969, p. 506-512. 12 refs.

Research supported by the Medical Research Council.

Study of the caliber of retinal vessels of normal human subjects at oxygen partial pressures ranging from 85 (11 per cent) to 1520 mm Hg (2 atm). It was found that retinal arterioles and venules dilated in response to breathing 11 per cent oxygen (hypoxia). The arterioles showed a 6 per cent and the venules a 12 per cent caliber increase. Vasoconstriction was noted in response to all higher oxygen concentrations studied. The degree of constriction increased throughout the investigated range up to 2 atm absolute. G.R.

## A70-10864

## MYOCARDIAL INFARCT AND OTHER PSYCHOSOMATIC DISTURBANCES; PROCEEDINGS OF THE SEVENTH INTERNATIONAL CONGRESS OF PSYCHOTHERAPY, WIESBADEN, WEST GERMANY, AUGUST 21-26, 1967. PART 3.

Edited by Th. Spoerri and W. Th. Winkler.

Basel, Switzerland, S. Karger AG (*Psychotherapy and Psychosomatics*, vol. 16, no. 4-5, 1968), 1969. 108 p. \$23.50.

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INTERDEPENDENCE OF ENVIRONMENT AND MAN IN THE CASE OF MYOCARDIAL INFARCTION (INTERDEPENDENZ VON UMWELT UND PERSON AM BEISPIEL DES HERZINFARKTES). P. Christian (Heidelberg, Universität, Heidelberg, West Germany), p. 22(210)-35(223). 54 refs. (See A70-10866 01-04)

PSYCHOSOMATIC ASPECTS OF THE INFARCTION PROFILE (PSYCHOSOMATISCHE ASPEKTE DES INFARKT-PROFILES). P. Hahn (Heidelberg, Universität, Heidelberg, West Germany), p. 36(224)-44(232). 11 refs. (See A70-10867 01-04)

## A70-10865

## PROSPECTIVE EPIDEMIOLOGICAL RECOGNITION OF THE CANDIDATE FOR ISCHEMIC HEART DISEASE.

R. H. Rosenman (Mount Zion Hospital and Medical Center, Harold Brunn Institute, San Francisco, Calif.).

IN: MYOCARDIAL INFARCT AND OTHER PSYCHOSOMATIC DISTURBANCES; PROCEEDINGS OF THE SEVENTH INTERNATIONAL CONGRESS OF PSYCHOTHERAPY, WIESBADEN, WEST GERMANY, AUGUST 21-26, 1967. PART 3. (A70-10864 01-04)

Edited by Th. Spoerri and W. Th. Winkler.

Basel, Switzerland, S. Karger AG (*Psychotherapy and Psychosomatics*, vol. 16, no. 4-5, 1968), 1969, p. 5(193)-13(201). 18 refs. Research supported by the San Francisco Heart Association, the American Heart Association, and Irwin Strasburger Memorial Medical Foundation; PHS Grants No. HE-03429; No. HE-05121.

Discussion of prospective epidemiological recognition of clinical coronary heart disease (CHD). A review of epidemiological data is presented, indicating that an increased incidence of CHD occurs in industrialized societies characterized by habitual physical inactivity, excessive dietary fat, and modern socioeconomic stresses, in particular, in individuals with attributes such as heavy cigarette smoking, hypertension, diabetes, and higher serum lipids. Nevertheless, groups of CHD victims prospectively show no differences of diet or exercise and only relatively small differences of mean smoking, blood pressure, and serum lipids compared with groups without CHD. Moreover, the majority of men exhibiting these risk factors remain free of CHD, and conversely, most victimized subjects are not prospectively characterized by such attributes. These discrepancies are explained in large part by the overt behavior pattern. Men with enhanced aggressiveness, competitiveness, drive for achievement, and chronic sense of time urgency exhibit a behavior pattern associated with significantly increased incidence of CHD, regardless of whether risk attributes are present or absent. Men with this behavior pattern exhibit the biological concomitants found in men with already present CHD. Men without such behavioral characteristics, who possess serum lipids at or below mean levels for the population, are strikingly immune to CHD regardless of the presence of any other risk attributes. O.H.

## A70-10866

## INTERDEPENDENCE OF ENVIRONMENT AND MAN IN THE CASE OF MYOCARDIAL INFARCTION (INTERDEPENDENZ

## VON UMWELT UND PERSON AM BEISPIEL DES HERZINFARKTES).

P. Christian (Heidelberg, Universität, Medizinische Universitäts-Klinik und Institut für Sozial- und Arbeitsmedizin, Sozialmedizinisch-klinische Abteilung, Heidelberg, West Germany).

IN: MYOCARDIAL INFARCT AND OTHER PSYCHOSOMATIC DISTURBANCES; PROCEEDINGS OF THE SEVENTH INTERNATIONAL CONGRESS OF PSYCHOTHERAPY, WIESBADEN, WEST GERMANY, AUGUST 21-26, 1967. PART 3. (A70-10864 01-04)

Edited by Th. Spoerri and W. Th. Winkler.

Basel, Switzerland, S. Karger AG (*Psychotherapy and Psychosomatics*, vol. 16, no. 4-5, 1968), 1969, p. 22(210)-35(223). 54 refs. In German.

Discussion of the interaction of external environmental factors, life habits, and personality structure in the development of coronary artery disease. Since the interaction of environmental and personal factors responsible for the development of coronary artery diseases may be regarded as proven, the major task remaining is to differentiate and determine the interaction of these factors with somatic risk factors. In order to ascertain these relationships, an approach to testing the development of coronary artery disease is proposed with makes it possible to methodically examine the influence of certain behavior styles, a number of biometric and psychological test correlations, and the psychosomatic aspects of myocardial infarction. O.H.

## A70-10867

## PSYCHOSOMATIC ASPECTS OF THE INFARCTION PROFILE (PSYCHOSOMATISCHE ASPEKTE DES INFARKTPROFILES).

P. Hahn (Heidelberg, Universität, Medizinische Universitäts-Klinik, Heidelberg, West Germany).

IN: MYOCARDIAL INFARCT AND OTHER PSYCHOSOMATIC DISTURBANCES; PROCEEDINGS OF THE SEVENTH INTERNATIONAL CONGRESS OF PSYCHOTHERAPY, WIESBADEN, WEST GERMANY, AUGUST 21-26, 1967. PART 3. (A70-10864 01-04)

Edited by Th. Spoerri and W. Th. Winkler.

Basel, Switzerland, S. Karger AG (*Psychotherapy and Psychosomatics*, vol. 16, no. 4-5, 1968), 1969, p. 36(224)-44(232). 11 refs. In German.

Discussion of the characteristic features of the organic and psychological risk factors in myocardial infarction. Characteristic features of both organic and psychological risk factors derived from epidemiological studies and psychological-psychosomatic findings, respectively, are reviewed, and their relevance is determined methodically. A characteristic case history showing infarction features in a 38-year-old craftsman is presented and demonstrated graphically. Based on this case history, the organic and psychological risk factors leading to myocardial infarction are methodically analyzed and discussed. By differentiating various findings and observations, effective interdependences are deduced, and it is shown that the psychosomatic aspects can be seen as interdependent products of various groups of factors within the total personality. O.H.

## A70-10880

## TRANSCUTANEOUS MEASUREMENT OF ARTERIAL BLOOD-VELOCITY BY ULTRASOUND.

R. G. Gosling, D. H. King, D. L. Newman, and J. P. Woodcock (Guy's Hospital, Medical School, Dept. of Physics, London, England).

IN: ULTRASONICS FOR INDUSTRY 1969; CONFERENCE, LONDON, ENGLAND, OCTOBER 7, 8, 1969, PROCEEDINGS. (A70-10877 01-14)

Edited by A. H. Crawford.

Guildford, England, Iliffe Science and Technology Publications, Ltd., 1969, p. 16-23. 12 refs.

Research supported by the Wellcome Trust.

Study of the conditions required for processing information from a Doppler-shift flowmeter in order to present a pulsatile waveform closely following that which would be recorded by an electromagnetic flowmeter. It is suggested that if a "true" waveform is obtained by expressing the energy in each harmonic as a percentage of the total oscillatory energy, it is possible to "normalize" and hence quantitatively compare waveforms recorded from different sites or different patients without using a flowmeter calibration constant, the only requirement being that the velocity-output response be linear. G.R.

## A70-10894

## NITROGENASE ACTIVITY IN HETEROCYSTS OF BLUE-GREEN ALGAE.

W. D. P. Stewart, A. Haystead, and H. W. Pearson (Dundee, University, Dept. of Biological Sciences, Dundee, Scotland).

*Nature*, vol. 224, Oct. 18, 1969, p. 226-228. 25 refs.

Research supported by the Royal Society, the Natural Environment Research Council, and the International Biological Programme.

Investigation of the nitrogenase activity of heterocysts, i.e., large empty looking cells which characterize nitrogen-fixing blue-green algae. The procedure of the investigations is described, and the results obtained are compared with data of other authors. It is

proved that heterocysts have the biochemical characteristics necessary for nitrogen fixation, that they are the loci of nitrogenase activity, that the requirements for nitrogenase activity in algae are similar to the requirements for nitrogenase activity in other nitrogen-fixing plants, and that the nitrogen fixed in heterocysts is transported rapidly to associated vegetative cells. O.H.

#### A70-10958 \*

##### REDUCED-GRAVITY SIMULATORS FOR STUDIES OF MAN'S MOBILITY IN SPACE AND ON THE MOON.

Donald E. Hewes (NASA, Langley Research Center, Hampton, Va.). *Human Factors*, vol. 11, Oct. 1969, p. 419-431.

Brief review of some reduced-gravity simulators recently developed at NASA-Langley to study specific problems relating to man's mobility in various space missions. The devices covered are the lunar walking simulator, the rotating space station simulator, and the lunar landing research facility. These facilities are applicable to a rather broad field of space activities, including walking on the lunar surface in a pressurized space suit, flying over the lunar surface with a backpack propulsion unit or a small rocket-propelled vehicle, driving a surface roving vehicle, and orbital assembly of spacecraft components. These facilities can also be applied to studies of space missions on other planets, moons, and asteroids. (Author)

#### A70-10959

##### WORK IN REDUCED-GRAVITY ENVIRONMENTS.

E. C. Wortz (Garrett Corp., AiResearch Manufacturing Co., Dept. of Life Sciences, Los Angeles, Calif.).

*Human Factors*, vol. 11, Oct. 1969, p. 433-439. 24 refs.

Research data on human performance in weightless and lunar-gravity environments are considered on a single continuum of reduced traction. Apparent contradictions in the effects of reduced gravity on tasks requiring the use of the upper torso and those requiring locomotion are resolved. It is concluded that reduced traction systematically reduces the efficiency of work in all reduced-gravity conditions. (Author)

#### A70-10960 \*

##### PROTOTYPE OF A NEW LUNAR-GRAVITY SIMULATOR FOR ASTRONAUT MOBILITY STUDIES.

Amos A. Spady, Jr. (NASA, Langley Research Center, Hampton, Va.).

*Human Factors*, vol. 11, Oct. 1969, p. 441-449. 5 refs.

The results of a study of existing lunar-gravity simulators indicate that a number of improvements could be made in the simulators being used to study the effects of reduced or lunar gravity on man's self-locomotive capability. This work reviews a prototype lunar-gravity simulator which was designed, built, and delivered to NASA-Langley. The simulator utilizes novel magnetic air bearings with constant-force motors and a unique body support system in that each of the body members are independently supported. (Author)

#### A70-10961

##### LUNAR SIMULATION.

Joseph L. Seminara and Richard J. Shavelson (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Sunnyvale, Calif.).

*Human Factors*, vol. 11, Oct. 1969, p. 451-462. 17 refs.

Examination of the combined effects of simulated lunar environmental variables on human performance. A facility was developed to simulate the following aspects of the astronaut's lunar environment: confinement within a lunar shelter habitat with an oxygen-enriched atmosphere, high-risk vacuum, lunar gravity, lunar

"terrain" characteristics, and spacesuit encumbrances. Four subjects were confined for five days in a simulated lunar shelter. During the fourth and fifth days, two subjects made two simulated sorties each outside the shelter. Basic maintenance and control tasks were performed under 1/6 g; pressurized spacesuit conditions were at chamber altitudes at 18,000 and 100,000 ft, respectively. Results of this testing at altitude were compared with baseline measures conducted under ambient sea level conditions. It was concluded that the combined effect of the simulated lunar environment variables can substantially degrade certain categories of astronaut performance. The reduced pressure of altitude as well as lunar gravity and spacesuit encumbrances appear to be significant factors affecting man's performance. (Author)

#### A70-10962 #

##### REDUCED-GRAVITY HUMAN FACTORS RESEARCH WITH AIRCRAFT.

Michael J. Moran (USAF, Aerospace Medical Research Laboratories, Flight Environments Branch, Wright-Patterson AFB, Ohio).

*Human Factors*, vol. 11, Oct. 1969, p. 463-471. 19 refs.

Discussion of the parabolic flight technique with aircraft as a means of producing approximately the same low-gravity conditions as in orbital space flight, thus making human factors research practical. Although the method has certain disadvantages, valuable results have been obtained in the areas of human engineering, and in the study of physical anthropology, physiology, and crew training and orientation. F.R.L.

#### A70-10963 \*

##### WATER IMMERSION REDUCED-GRAVITY SIMULATION.

Otto F. Trout, Jr. (NASA, Langley Research Center, Hampton, Va.) and William J. Bruchey, Jr. (Environmental Research Associates, Randallstown, Md.).

*Human Factors*, vol. 11, Oct. 1969, p. 473-487. 17 refs.

Navy-supported research; Contract No. NAS 1-4059.

Description of a water immersion technique for simulating zero- and partial-gravity conditions in studies of extravehicular task areas in space. The technique allows the pressure-suited subject to move in six degrees of freedom unencumbered by connecting supports and simulates his biomechanical performance in weightless space. The technique is useful in examining the astronaut's capability to execute extravehicular work procedures, in developing man-system engineering data, and as a training system. Several extravehicular task areas have been examined, including ingress-egress through airlock systems, manual self-locomotion, manipulation and maintenance tasks, and assessment of rescue procedures. Although limited in the study of rapid translatory tasks by the drag and damping effects of the water, the technique permits a perceptual equivalent simulation of complex manipulative tasks in real time. Test procedures, equipment, and several typical tests are described. (Author)

#### A70-10964 \*

##### FORCE APPLICATION IN SIMULATED ZERO GRAVITY.

D. G. Norman (General Electric Co., Missile and Space Div., Valley Forge, Pa.).

*Human Factors*, vol. 11, Oct. 1969, p. 489-505. 7 refs.

Contract No. NAS 8-18117.

Utilizing zero-gravity simulation techniques, six subjects provided basic force exertion data under various conditions of personnel restraints, worksite geometry, and type and direction of forces to be exerted. All data reported were collected with subjects wearing Apollo suits pressurized to 3.5 psig. Current efforts are providing baseline data under 1-g and zero-gravity shirt-sleeve conditions. This study is part of an ongoing program of research on man's role in maintaining advanced space systems. (Author)

A70-10965

**THE SIMULATION OF WEIGHTLESSNESS USING WATER IMMERSION TECHNIQUES—AN ANNOTATED BIBLIOGRAPHY.**

John H. Duddy (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Sunnyvale, Calif.).

*Human Factors*, vol. 11, Oct. 1969, p. 507-539. 283 refs.

Bibliography of 283 selected references pertaining to behavioral and biomedical research using water immersion techniques. References are organized under three topics: (1) physiological responses to weightlessness, (2) human performance under weightless conditions, and (3) simulation techniques, equipment, and facilities. A brief overview of each topic is presented, and the contents are selectively annotated. (Author)

A70-10972 #

**PERFORMANCE OF AN ORGANIC AMINE AS A REGENERABLE ABSORBENT FOR CO<sub>2</sub> REMOVAL IN SPACECRAFT.**

A. J. Glueckert, G. A. Remus, and R. Martin (General American Transportation Corp., Niles, Ill.).

*American Institute of Chemical Engineers, Annual Meeting, 62nd, Washington, D.C., Nov. 16-20, 1969, Paper 29 f. 12 p. \$0.75.*

Description of a cycling two-bed system for the removal of carbon dioxide using a regenerable absorbent consisting of an amine in a solidified granular form. This sorbent can absorb acid gases, such as carbon dioxide or hydrogen sulfide, from a gas mixture. It is readily regenerated by simultaneously heating to 180 deg F and evacuating to an absolute pressure of 40 mm Hg. The constructed two-bed cycling system weighs 93 lb. The Box-Wilson central composite design was used to evaluate the effects of cycling time, precool time, coolant flow, and air flow on carbon dioxide removal rate, water loss, and power. Empirical equations are developed since values for physical properties are not known. The possible improvements of the system developed are discussed. Z.W.

A70-10973 \* #

**INTEGRATED LIFE SUPPORT SYSTEMS—A MULTIDISCIPLINE EFFORT.**

R. W. Johnson (NASA, Langley Research Center, Hampton, Va.).

*American Institute of Chemical Engineers, Annual Meeting, 62nd, Washington, D.C., Nov. 16-20, 1969, Paper 29 e. 18 p. 11 refs. \$0.75.*

Integrated life support systems have been designed, fabricated, and are currently being used as focal points for research and development efforts in government and industry. The Langley integrated life support system and supporting equipment are discussed in detail. Results from intermittently manned tests include system engineering performance, atmospheric and water chemical analyses, and microbial measurements. Generalized correlations are made of the above system with other manned integrated life support systems in government and industry. (Author)

A70-10976

**INHALED ARGON BOLUSES IN MAN.**

G. Cumming, J. G. Jones, and K. Horsfield (Queen Elizabeth Hospital, Dept. of Medicine, Birmingham, England).

*Journal of Applied Physiology*, vol. 27, Oct. 1969, p. 447-451. 12 refs.

Research supported by The British Heart Foundation; Contract No. AF 61(052)-775.

Investigation of the pattern of gas mixing between the large airways and the alveolar spaces, using a bolus of argon inspired to

different depths within the normal lung, and analyzing the expired gas. The tracer gas was completely recovered when it was introduced to a volume less than 100 ml, showed a rapidly increasing loss between 100 and 350 ml, and at depths greater than this little further loss occurred. These results have been interpreted together with the shape of the single-breath nitrogen test, and as a consequence it is suggested that this test might contain information about the asymmetry of the lungs and its effects on gas transit times. (Author)

A70-10977

**PERIPHERAL INVOLVEMENT IN THERMOREGULATORY RESPONSE TO AN IMPOSED HEAT DEBT IN MAN.**

Ethan R. Nadel and Steven M. Horvath (California, University, Institute of Environmental Stress, Santa Barbara, Calif.).

*Journal of Applied Physiology*, vol. 27, Oct. 1969, p. 484-488. 19 refs.

Research supported by the Santa Barbara County Heart Association; Contract No. Nonr-4222(07).

A negative heat load (minus 45 kcal due to the rapid ingestion of ice cream) was added to the body core of three male adults during exposure to four different ambient environments. The subject's mean skin temperature was held relatively constant during each exposure and systematically varied between experiments, thereby effectively isolating the skin thermoreceptors from the central thermoreceptors. The tympanic membrane temperature decreased 0.8 deg C in response to the central heat debt. The initial metabolic response to the central temperature deficit was found to be inversely related to the mean skin temperature. Below an average mean skin temperature of 33.8 deg C, there was an increase of 17.4 kcal/sq m-hr per deg C of decreasing skin temperature. There was also a tendency toward minimal blood flow in the forearm, commensurate with maintaining the circulation through the muscle mass regardless of the ambient temperature. It was concluded that cold reception in the body core could be an important factor in the elicitation of an appropriate thermoregulatory response. (Author)

A70-10978

**HEMOCONCENTRATION AT ALTITUDE.**

D. B. Dill, S. M. Horvath, Thomas E. Dahms, Robert E. Parker, and John R. Lynch (Nevada, University, Desert Research Institute, Laboratory of Environmental Patho-Physiology, Boulder City; Nevada, University, Dept. of Biological Sciences, Las Vegas, Nev.; California, University, Institute of Environmental Stress, Santa Barbara, Calif.).

*Journal of Applied Physiology*, vol. 27, Oct. 1969, p. 514-518. 15 refs.

PHS Grant No. GM-15693-01; NSF Grant No. 5217; Grant No. AF AFOSR 69-1653.

Concentration of hemoglobin in blood, (Hb)b, blood volume (BV), and related observations were made on 12 men, aged 18 to 77 years, during two to six weeks at 3800 m. Concentration of hemoglobin in red cells, (Hb)c, and red cell volume (CV) remained constant at altitude, although in some men CV increased post-altitude. With (Hb)c and CV constant, plasma volume (PV) could be calculated from (Hb)b. Mean (Hb)b increased 17 per cent in two weeks; PV decreased. However, in Dill, aged 77 years, during the first week (Hb)b decreased and PV increased and in ERN, aged 26 years, (Hb)b was nearly unchanged for eight days. Neither increases nor decreases in (Hb)b correlated with changes in body weight which presumably reflected changes in body water. While concentration of plasma protein generally increased in the first weeks at altitude, total plasma protein did not change consistently. (Author)

## A70-10979

## SYMPATHOADRENOMEDULLARY RESPONSE OF THE RAT TO HIGH OXYGEN EXPOSURES.

Morton H. Cross and Rodney T. Houlihan (Pennsylvania State University, Dept. of Biology, University Park, Pa.).

*Journal of Applied Physiology*, vol. 27, Oct. 1969, p. 523-527. 27 refs.

Research supported by the Pennsylvania Agricultural Experiment Station; Contract No. NR-102-645.

Study of the response of the sympathoadrenomedullary system of adult male rats to increased oxygen tensions ranging from 460 mm Hg at ambient pressure to 4500 mm Hg. The catecholamines, norepinephrine, and epinephrine were measured in the adrenal gland, hypothalamus, serum, and urine by the trihydroxyindole fluorimetric method after toxic and nontoxic exposures. As reflected by these catecholamine levels, rats initially react to increased oxygen tensions by an adrenergic nerve depression which enables the animal to adapt to less severe environments (460 mm Hg) with no adverse effects. As the oxygen environment becomes fatal (690 mm Hg) it causes a sustained sympathetic outflow and concomitant release of excessive adrenal epinephrine. At higher oxygen pressures, the sympathetic centers are vigorously stimulated, neurogenic seizures are precipitated, hypothalamic norepinephrine becomes depleted, and a massive epinephrine release occurs. The data support the hypothesis of sympathetic nervous system participation in oxygen toxicity. (Author)

## A70-10980

## MECHANICS OF RESPIRATION DURING SUBMERSION IN WATER.

S. K. Hong (Hawaii, University, School of Medicine, Dept. of Physiology, Honolulu, Hawaii), H. Rahn (New York, State University, School of Medicine, Dept. of Physiology, Buffalo, N.Y.), P. Cerretelli, and J. C. Cruz.

*Journal of Applied Physiology*, vol. 27, Oct. 1969, p. 535-538. 15 refs.

USAF-supported research; PHS Grant No. 1 F05-TW-683.

The changes in the lung volumes, the total intrapulmonary pressure (Pt), the intragastric pressure (Pg), and the total work of breathing during submersion in water to the neck level were studied in four human subjects. Control measurements were made with the subject submerged up to the level of the xiphoid process. The Pt curve shifted to the right by 16 cm water during submersion, while Pg increased gradually from 0 to 35-45 cm water. Both the vital capacity (VC) and the expiratory reserve volume decreased while the tidal volume remained unchanged during submersion. Increases in the change of VC obtained immediately following a Valsalva maneuver after submersion suggest that approximately 60 per cent of the reduction in VC observed is due to an increased intrathoracic blood volume and the rest to hydrostatic forces. The total work of breathing for a tidal volume of 1 liter increased during submersion by approximately 60 per cent, most of it due to an increase in the elastic work. (Author)

## A70-11025

## DIAMETER OF HEART MEASURED BY INTRACAVITARY ULTRASOUND.

Richard A. Carleton, Robert W. Sessions, and John S. Graettinger (Presbyterian-St. Luke's Hospital, Chicago, Ill.).

*Medical Research Engineering*, vol. 8, May-June 1969, p. 28-32. 10 refs.

Research supported by the Chicago Heart Association; PHS Grant No. HE-09923-02.

Description of a cylindrical piezoelectric ultrasonic crystal mounted on the tip of a cardiac catheter to obtain measurements of cardiac diameter. Tests conducted in vitro and in excised canine

hearts demonstrate close correspondence of the distance equivalent of the ultrasonic reflections and of direct caliper measurements. The equipment is electrically safe for use in hearts provided the excitation rate of the crystals exceeds 350 cycles per sec. The heart-lung acoustical interface provides clear ultrasonic returns in intact dogs. Measurements of cardiac diameter made using these returns agree closely with simultaneous radiographic measurements of diameter made at the level of the intracavitary transducer.

(Author)

## A70-11029 #

## EFFECT OF ARTIFICIAL VENTILATION OF THE LUNGS ON THE CARBONIC ANHYDRASE ACTIVITY IN THE BLOOD (VLIANIE ISKUSSTVENNOI VENTILIATSII LEGKIKH NA AKTIVNOST' UGOL'NOI ANGIDRAZY KROVI).

L. V. Kunchuliia (Tbilisskii Gosudarstvennyi Institut Uovershenstvovaniia Vrachei, Tiflis, Georgian SSR).

*Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 55, Aug. 1969, p. 421-424. 8 refs. In Russian.

Study of the carbonic anhydrase activity in the blood of a group of 43 anesthetized patients during artificial lung ventilation at normal or slightly to moderately higher-than-normal rates. Increased anhydrase activity rates were established in patients under hyperventilation, while the anhydrase activity was depressed in six patients who were occasionally exposed to hypoventilation during the experiment. V.Z.

## A70-11030 #

## CERTAIN DATA CONCERNING THE QUANTITATIVE CHARACTERISTIC OF NEUROGLIAL INTERRELATIONS IN THE VISUAL CORTEX OF DOGS (NEKOTORYE DANNYE O KOLICHESTVENNOI KHARAKTERISTIKE NEIROGLIAL'NYKH VZAIMOOTNOSHENII V ZRITEL'NOI OBLASTI KORY GOLOVNOGO MOZGA SOBAK).

E. I. Dzamoieva and A. L. Mikeladze (Akademiia Nauk Gruzinskoi SSR, Institut Fiziologii, Tiflis, Georgian SSR).

*Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 55, Aug. 1969, p. 453-456. 7 refs. In Russian.

Study of the quantitative relations between the numbers of neurons and perineuronal glial cells in the primary and secondary sections of the visual cortex removed from a group of five anesthetized dogs. Statistical analysis indicates that oligodendrocytes prevail over astrocytes as neuron satellites in both sections. The presence of large numbers of neurons with satellites in the middle and lower layers of the cortex is noted. V.Z.

## A70-11039 #

## CONNECTIONS BETWEEN THE AUDITORY CORTEX (ZONE Ep) AND THE CLAUSTRUM (SVIAZI SLUKHOVOI KORY /ZONY Ep/ S OGRADOI).

V. A. Otellin (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR).

*Akademiia Nauk SSSR, Doklady*, vol. 187, Aug. 11, 1969, p. 1198-1200. 10 refs. In Russian.

Morphological study of the connections between zone Ep of the auditory cortex and the claustrum in a group of anesthetized cats. The presence of efferent nerve fibers between zone Ep and the claustrum is established by microscopic examination of slices of the cerebra of the cats. V.Z.

# A70-11040 #

## HYPOTHESIS CONCERNING THE MECHANISM OF FORMATION OF TEMPORARY CONNECTIONS (GIPOTEZA O MEKHAZIME OBRAZOVANIIA VREMENNYKH SVIAZEI).

A. I. Roitbak (Akademiia Nauk Gruzinskoi SSR, Institut Fiziologii, Tiflis, Georgian SSR).

*Akademiia Nauk SSSR, Doklady*, vol. 187, Aug. 11, 1969, p. 1205-1208. 16 refs. In Russian.

Outline of a hypothetical mechanism of the preexistence of temporary interneuron connections which become active in the process of development of conditioned reflexes. This hypothesis relies on the fact that the cortex consists of nerve and glial cells and that cellular membranes of one type are in intimate contact with cellular membranes of the other type. Essential in this hypothesis is the assumption that a sufficiently strong peripheral stimulus produces in membranes of both types significant responses which result in the formation of temporary associative interneuron connections.

V.Z.

# A70-11044

## ON-LINE COMPUTATION OF STROKE VOLUME FROM AORTIC FLOW.

John T. Temples, Kenneth M. Kent, and E. Converse Peirce, II (Emory University, School of Medicine, Dept. of Surgery and Dept. of Physiology, Atlanta, Ga.).

*Medical Research Engineering*, vol. 8, Mar.-Apr. 1969, p. 27, 28.

PHS Grant No. HE-09253.

Description of a simple electronic system which, when used with an electromagnetic flowmeter, yields a beat-by-beat analog readout of stroke volume and offers rapid data analysis. The phasic flow signal from the flowmeter is integrated, the integrator being turned on at the beginning of systole and reset at the end of systole. The integrator control may be either the flow signal itself or left-ventricular pressure. The system is unaffected by flowmeter baseline noise, 60-Hz interference, arrhythmias, or cardiac pacing. Comparisons of electronically derived and manually derived (planimetric) stroke volumes show good agreement.

(Author)

# A70-11051 \*

## THE SENSING OF RETINAL SIZE.

Walter C. Gogel (California, University, Santa Barbara, Calif.).

*Vision Research*, vol. 9, Sept. 1969, p. 1079-1094. 21 refs.

Grant No. NGR-05-010-010.

Reassessment of a hypothesis that under reduced conditions of observation the perceived size is the result of a direct response to retinal size. This hypothesis is contrasted with a size-distance invariance hypothesis according to which a perceived size results from a retinal size only when an appropriate perceived distance is also present. Four experiments were conducted. The first two indicate that, in the absence of distance cues, perceived size is proportional to retinal size. The last two experiments suggest that this result is a consequence of the tendency, under reduced conditions, to perceive the objects at a common (specific) distance. The results support the size-distance invariance hypothesis and are in opposition to the direct perception of retinal size. The possible significance of the specific distance tendency is discussed for binocular as well as monocular conditions of observation.

O.H.

# A70-11052

## THE EFFECT OF BACKGROUND LUMINANCE ON THE BRIGHTNESS OF FLASHES.

Paul Whittle and P. D. C. Challands (Cambridge University, Psychological Laboratory, Cambridge, England).

*Vision Research*, vol. 9, Sept. 1969, p. 1095-1110. 24 refs.

PHS Grant No. NB-01453.

Investigation of the effect of background luminance on the brightness of flashes, performed by measuring, for a wide range of background luminances, both the increment threshold and the luminances required to produce various brightnesses. Interocular brightness matches were made between flashes of light, one to each eye, added to large steady uniform backgrounds of different luminances. The backgrounds were binocularly superimposed. Under these conditions, constant-brightness curves were of approximately the same shape as the increment threshold curve. The brightness of a flash in one eye was unaffected by a background in the other. It is argued that these experiments measure only the contribution of retinal mechanisms. Further experiments provide some evidence of central influences. The relation between retinal and central mechanisms in the perception of brightness is discussed.

O.H.

# A70-11053

## THE AUTOCORRELATION FUNCTION AND BINOCULAR BRIGHTNESS MIXING.

G. R. Engel (Waterloo, University, Waterloo, Ontario, Canada).

*Vision Research*, vol. 9, Sept. 1969, p. 1111-1130. 16 refs.

National Research Council of Canada Grant No. APA-216.

Discussion of an explicit formulation of a previously outlined theoretical model of the perceptual correlates underlying binocular brightness mixing, and of the results of some tests of the ability of this model to reproduce independently published data. According to this model, the brightness of the binocular combination of any pair of monocular brightnesses is equal to the vector sum of the monocular brightnesses, each monocular brightness being weighted in proportion to the contour and contrast properties of the monocular stimulus. The monocular weightings are derived from a special autocorrelation function which provides a measure of contour and contrast. It is shown that the model successfully reproduces, by means of computer simulation, the results of six previously published experiments on binocular brightness mixing. In addition, it is demonstrated that the autocorrelation function has a potential application to other, more general problems of pattern perception.

O.H.

# A70-11054

## A TETRACHROMATIC HYPOTHESIS FOR HUMAN COLOR VISION.

Carl R. Ingling, Jr. (Rochester, University, Center for Visual Science, Rochester, N.Y.).

*Vision Research*, vol. 9, Sept. 1969, p. 1131-1148.

NSF Grant No. GZ-414; NIH Grant No. NB-00624-14.

Discussion of human foveal color vision in the light of a tetrachromatic hypothesis. It is hypothesized that human foveal color vision might be tetrachromatic at the first, or photopigment, stage, with immediate convergence to three channels. Evidence cited to support this assertion is the breakdown of color matches at high intensities, the similarity of the breakdown condition to protanomaly, the questionableness of the high-density hypothesis, the failure of the submaximum of the luminosity curve at 605 nm to shift with selective adaptation, and the marked reduction of this submaximum at high intensities.

O.H.

# A70-11055

## DEVELOPMENT AND EXECUTION OF SACCADIC-ADAPTATION TO THE STIMULUS TRACE (ELABORATION ET DECISION DES SACCADIC-ADAPTATION A LA TRACE DU STIMULUS).

J. Pernier, M. Jeannerod, and P. Gerin (Hôpital Neurologique, Laboratoire de Neuro-Electrologie, Lyons; Institut National de la

Santé et de la Recherche Médicale, Paris, France).  
*Vision Research*, vol. 9, Sept. 1969, p. 1149-1165. 39 refs. In French.

Investigation of the effect of the duration of brief visual stimuli on the precision of saccades and on the length of the reaction time preceding it. The saccades were determined by the occurrence of brief visual stimuli (light flashes lasting from 20 to 200 msec) in the peripheral visual field (10 deg) in normal subjects. Since the reaction time of a saccade (220 msec mean under control conditions) exceeded the duration of the stimulus, the saccade was thus completed after the end of the stimulus—i.e., without any possible visual reference. The test results obtained are discussed and analyzed. It is shown that these results are suggestive of a model describing the preparation and execution of a saccade which should include a storage of the information concerning the stimulus position, as a trace related quantitatively to the stimulus position and quantitatively to its angular distance, and a progressive decision-making process tending to render effective the connection between the trace and the execution mechanisms. O.H.

#### A70-11056

##### VOLUNTARY CONTROL OF SMOOTH PURSUIT VELOCITY.

Robert M. Steinman, Alexander A. Skavenski, and Richard V. Sansbury (Maryland, University, Dept. of Psychology, College Park, Md.).

*Vision Research*, vol. 9, Sept. 1969, p. 1167-1171. 5 refs.  
 PHS Grant No. NB-06361.

Discussion of a finding by Puckett and Steinman (1969) that the frequency of saccades during tracking was under voluntary control. These authors reported that their subjects adopted highly saccadic or almost saccade-free modes of tracking and changed from one to another behavior when asked to do so. This assertion is discussed in detail. It is shown that these subjects can also exercise voluntary control over the velocity of their smooth pursuits. O.H.

#### A70-11063

##### EFFECT OF $\text{Na}^+$ AND $\text{K}^+$ ON MITOCHONDRIAL RESPIRATORY CONTROL, OXYGEN UPTAKE, AND ADENOSINE TRIPHOSPHATASE ACTIVITY.

A. Gómez-Puyou, F. Sandoval, A. Peña, E. Chávez, and M. Tuena (México, Universidad Nacional Autónoma, Mexico City, Mexico).

*Journal of Biological Chemistry*, vol. 244, Oct. 10, 1969, p. 5339-5345. 31 refs.

Study of the effects of positive sodium and potassium ions on the respiratory control and oxidative phosphorylation of isolated rat liver mitochondria incubated with ethylenediaminetetraacetate in the absence and presence of added magnesium ions. Data are presented which indicate that in certain experimental conditions a different behavior of the phosphorylative capacity of mitochondria toward added positive sodium and potassium ions may be shown. An attempt was made to study the mechanism by which these ions exert the effects. The results suggest that sodium has a detrimental effect on a component of the oxidative phosphorylation process in intact mitochondria. O.H.

#### A70-11075

##### PRESSURE-FLOW RELATIONSHIPS IN THE CORONARY CIRCULATION.

Wadie M. Fam and Maurice McGregor (Royal Victoria Hospital, McGill University Clinic, Montreal, Canada).

*Circulation Research*, vol. 25, Sept. 1969, p. 293-301. 16 refs.  
 Medical Research Council of Canada Grant No. MT-1241.

Study designed to define more accurately the respective influences of perfusion pressure and flow on coronary resistance. Resistance in a coronary branch, perfused at constant flow, was

reduced immediately following temporary perfusion arrest. Large epicardial arteries did not appear to take part in this reaction. In the first 10 to 15 sec after flow was restored, resistance for that flow was uninfluenced by the duration of the preceding perfusion arrest. The mechanism which caused coronary resistance to fall as a result of metabolic factors, such as reduced availability of oxygen, was thus maximally activated. By observing the relationship of coronary resistance to perfusion pressure at this time, it could be shown that resistance vessels and their surrounding structures showed little evidence of distensibility (resistance constant from 20 to 60 mm Hg). The difference between resistance at steady state and resistance at maximal vasodilatation defines the extent of vasomotion attributable at any flow rate to metabolic factors. Perfusion with venous blood caused a fall of resistance which was greater at any flow rate than could be accounted for by the differences in oxygen delivery rate.

(Author)

#### A70-11160

##### SOME ASPECTS OF THE BIOMECHANICS OF THE MICRO-CIRCULATION, ANNO 1969.

George Bugliarello (Carnegie-Mellon University, Pittsburgh, Pa.).

IN: MIDWESTERN MECHANICS CONFERENCE, 11TH, IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY, AMES, IOWA, AUGUST 18-20, 1969, PROCEEDINGS. (A70-11126 01-32)  
 Conference supported by the National Science Foundation.

Edited by H. J. Weiss, D. F. Young, W. F. Riley, and T. R. Rogge.

Ames, Iowa State University Press (Developments in Mechanics. Volume 5), 1969, p. 921-962. 114 refs.

NIH Grants No. HE-05557; No. GM-1455.

Review of recent advances in selected aspects of the biomechanics of circulation. The rheological characteristics of blood, the erythrocyte, and the vessel wall, are briefly surveyed, while the flow in the larger vessels in the microcirculation both under steady and pulsating conditions, the flow in the capillaries, and the hydrodynamics of erythrocyte-shaped bodies are reviewed in greater detail. Attempts at building mathematical as well as physical models are described, and some of the principal problems demanding solution are indicated. (Author)

#### A70-11163

##### BACKWARD MASKING-FACILITATION THROUGH INCREASED TARGET-FIELD LUMINANCE AND DURATION.

Dean G. Purcell (Toronto, University, Toronto, Canada), Alan L. Stewart (Albion College, Albion, Mich.), and William N. Dember (Cincinnati, University, Cincinnati, Ohio).

*Psychonomic Science*, vol. 15, Apr. 25, 1969, p. 87, 88. 14 refs.

NIH Grant No. NB-07622-02.

Studies of visual backward masking demonstrate that increases in target-field luminance or duration will decrease the target's susceptibility to masking. A proposed theory predicts that, within certain limits, increases in target-field luminance or duration will increase the target's susceptibility to masking. Two experiments support these predictions. (Author)

#### A70-11164

##### THE EFFECTS OF LINE LENGTH ON SEQUENTIAL BLANKING.

W. H. Buchsbaum and M. S. Mayzner (New York University, Bronx, N.Y.).

*Psychonomic Science*, vol. 15, Apr. 25, 1969, p. 111, 112. 14 refs.

NSF Grant No. GB-8037; Contract No. N 00014-67-A-0467-0001.

Investigation of the sequential blanking effect, employing a computer-based CRT display system. It is shown that with five vertical lines displayed sequentially in a particular irregular order at a specific input rate, two of the five lines will not be perceived, if all

five lines are of equal length. However, if the two blanked lines are either increased or decreased in length relative to the three unblanked lines, then all five lines will be perceived. The results are interpreted in terms of a visual information processing model involving complex patterns of lateral inhibition interacting within receptive fields of varying orders of complexity in the visual cortex.

(Author)

## A70-11165

## VISUAL TEMPORAL DISCRIMINATION—A POINT OF ORDER.

Carl E. Sherrick (Princeton University, Princeton, N.J.).

*Psychonomic Science*, vol. 15, May 25, 1969, p. 218. 9 refs.

Discussion of the discrepancies in results between two experiments on the visual detection of temporal order. It is suggested that the differences arise in great part from the definition of interstimulus interval. The controversy resulting from the misunderstanding is reviewed briefly but optimistically.

(Author)

## A70-11166

## HEART RATE AND SKIN CONDUCTANCE RESPONDING DURING THREE ATTENTION-DIRECTION TASKS.

Ross Buck, Robert E. Miller, and William F. Caul (Pittsburgh, University, School of Medicine, Laboratory of Clinical Science, Pittsburgh, Pa.).

*Psychonomic Science*, vol. 15, June 25, 1969, p. 291, 292. 6 refs.

Research supported by the Commonwealth of Pennsylvania; NIH Grant No. MHO-0487.

Attempt to determine whether differential heart rate responding can be demonstrated in tasks involving environmental acceptance and rejection when subjects are instructed that no overt verbalization will be required. A study is made of the position that tasks involving proprioceptive stimuli occupy on the continuum between environmental acceptance and rejection. Twelve male subjects were instructed to turn their attention toward: (1) feeling their internal bodily events (body task), (2) remembering events that happened to them on the preceding day (cognitive task), and (3) looking at a series of slides (external task). They were assured that no verbal report would be required. Cardiac deceleration occurred during the body and external tasks. The body task was associated with a decrease on skin conductance measures.

Z.W.

## A70-11167

## VARIABILITY OF SIGNAL DETECTION MEASURES WITH NOISE TYPE.

Patrick H. McCann (U.S. Navy, San Diego, Calif.).

*Psychonomic Science*, vol. 15, June 25, 1969, p. 310, 311.

The effects of continuous noise vs intermittent noise on subjects performing an audio-visual checking task were examined using TSD (theory of signal detectability) measures of performance. TSD measures were relatively stable for all subjects during both intermittent and continuous noise conditions and closely approximated the values which would be expected in a psychophysical setting. During the last 20 min of the duty period there was a corresponding increase in the subjects' response criterion.

(Author)

## A70-11249 #

## HYPOXIA TOLERANCE OF RATS AFTER ADAPTATION TO HYPERCAPNIA.

William F. Pepelko (USAF, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.).

*Society for Experimental Biology and Medicine, Proceedings*, vol.

131, Sept. 1969, p. 1323-1325. 8 refs.

Experimental investigation of hypoxic tolerance of rats following adaptation to hypercapnia. Thirty rats were tested for time of useful consciousness (TUC) by recording the time they could cling to a steeply sloping surface after decompression to a barometric pressure corresponding to 30,000 ft altitude. After testing, the rats were returned to ground level conditions for one month. They were then exposed continuously for three to four days to an environment containing a partial pressure of 90 torr carbon dioxide and tested for TUC again immediately after removal from the high carbon dioxide environment. TUC decreased from 17.6 min to 4.8 min after adaptation to hypercapnia. These data support present theories concerning the role of carbon dioxide in the regulation of expiration.

M.M.

## A70-11256 #

## APPLICATION OF THE ACHIEVEMENTS OF ASTRONAUTICS TO BIOLOGY AND MEDICINE (ZASTOSOWANIE OSIĄGNIĘĆ ASTRONAUTYKI W BIOLOGII I MEDYCYNIE).

Krystyna Galubińska.

*Postępy Astronautyki*, vol. 3, no. 2, 1969, p. 123-143. 13 refs. In Polish.

Review of the contributions of aerospace technology to the fields of biology and medicine. Topics discussed include biomedical problems in astronautics and the utilization of results obtained in space research for solving certain biological and medical problems.

Z.W.

## A70-11259

## TECHNOLOGY AND ANTHROPOTECHNICAL DESIGN OF VISUAL FLIGHT DISPLAYS. I—INTRODUCTION TO THE TECHNOLOGICAL AND ANTHROPOTECHNICAL DEVELOPMENT OF FLIGHT DISPLAYS (TECHNIK UND ANTHROPOTECHNISCHE AUSLEGUNG VISUELLER FLUGANZEIGEN. I—EINFÜHRUNG IN DIE TECHNISCHE UND ANTHROPOTECHNISCHE ENTWICKLUNG DER FLUGANZEIGEN).

R. Bernotat (Gesellschaft zur Förderung der Astrophysikalischen Forschung, Forschungsinstitut für Anthropotechnik, Meckenheim, West Germany).

*Luftfahrttechnik Raumfahrttechnik*, vol. 15, Aug.-Sept. 1969, p. 204-206. 9 refs. In German.

Analysis using the concepts of human engineering and visual displays to outline the developmental trends of flight displays, starting from simple mechanical instruments, proceeding to electro-mechanical instruments, and then to currently used electronic display systems and second-generation systems incorporating sensors, computers, and electronic displays. The necessity of human engineering research is demonstrated by the example of a rotating reference frame and the data processing phases involved in the implementation of visual displays.

V.P.

## A70-11260

## TECHNOLOGY AND ANTHROPOTECHNICAL DESIGN OF VISUAL FLIGHT DISPLAYS. II—IMPROVING THE INTERACTION BETWEEN PILOT AND AIRCRAFT (TECHNIK UND ANTHROPOTECHNISCHE AUSLEGUNG VISUELLER FLUGANZEIGEN. II—VERBESSERUNG DES ZUSAMMENWIRKENS VON FLUGZEUGFÜHRER UND FLUGZEUG).

R. Beyer (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugführung, Abteilung für Instrumentierung, Braunschweig, West Germany).

*Luftfahrttechnik Raumfahrttechnik*, vol. 15, Aug.-Sept. 1969, p. 206-208. In German.

Discussion of the problem of improving the man/machine interaction in aircraft guidance and control with the aid of electronic



displays. It is shown that, in order to use the new technology to best advantage, system-theoretical considerations are required, particularly with respect to onboard input data and methods of developing guidance and control displays as an integral part of flight control systems. The desired improvement in the efficiency of the total man/machine system, in cost effectiveness, and in flight safety is shown to depend primarily on the degree to which the pilot is relieved of pure control activities. V.P.

#### A70-11275 \*

##### INHIBITION OF EATING AND DRINKING FOLLOWING HYPOTHALAMIC STIMULATION IN THE RAT.

Verne C. Cox, Jan W. Kakolewski, and Elliot S. Valenstein (Fels Research Institute, Yellow Springs, Ohio).

*Journal of Comparative and Physiological Psychology*, vol. 68, no. 4, 1969, p. 530-535. 14 refs.

NIH Grant No. M-4529; Grant No. NGL-36-005-001.

Investigation of the appetitive behavior of rats immediately following the cessation of hypothalamic stimulation. It is found that during this period there can be a marked inhibition of normal eating and drinking of hungry and/or thirsty animals. This effect was observed in a significantly greater number of animals that displayed stimulus-bound eating and drinking than among animals that responded to hypothalamic stimulation with only locomotor-exploratory behavior. In the case of the one exception among the negative animals, there was evidence that stimulation had occasionally elicited appetitive behavior during the initial screening procedure. The results obtained are contrasted with other reports of persistence or initiation of appetitive behavior following stimulation of the hypothalamus and other brain areas. P.G.

#### A70-11300 \*

##### ERYTHROPOIETIC RESPONSE IN DOGS GIVEN SUBLETHAL WHOLE-BODY PROTON IRRADIATION FOLLOWED BY HYPOXIC HYPOXIA.

Henry Aceto, Jr., Robert Springsteen, H. S. Winchell, C. A. Tobias (California, University, Donner Laboratory and Lawrence Radiation Laboratory, Berkeley, Calif.), and W. Gee (California, University, Donner Laboratory and Lawrence Radiation Laboratory, Berkeley; California, University, School of Veterinary Medicine, Radiobiology Laboratory, Davis, Calif.).

*Radiation Research*, vol. 39, July 1969, p. 101-111. 14 refs.

NASA-supported research; AEC Contract No. W 12-792-(02).

Study of the erythropoietic response in anesthetized dogs subjected to a sublethal whole-body exposure of 200 rads delivered by a degraded 730-MeV proton beam whose residual mean energy is 265 MeV. The test procedure is described in detail, and the results are discussed. It is demonstrated that irradiated erythropoietic cells are capable of normal or increased rates of hemoglobin synthesis when subsequently stimulated by hypoxic hypoxia. The results of these findings are considered both in regard to relative radiosensitivities of erythropoietic cells of different ages and in regard to erythropoiesis in astronauts subjected to combined radiation and hypoxic stress. O.H.

#### A70-11309

##### GERM-FREE BIOLOGY—EXPERIMENTAL AND CLINICAL ASPECTS; PROCEEDINGS OF AN INTERNATIONAL SYMPOSIUM ON GNOTOBIOLOGY, BUFFALO, N.Y., JUNE 9-11, 1968.

Symposium sponsored by the Roswell Park Memorial Institute, the State University of New York, and the Association for Gnotobiotics. Edited by E. A. Mirand (Roswell Park Memorial Institute; New York, State University; Canisius College, Buffalo; New York State, Dept. of

Health, Albany; Niagara University, Niagara University, N.Y.) and Nathan Back (New York, State University, School of Pharmacy, Dept. of Biochemical Pharmacology, Buffalo, N.Y.).

New York, Plenum Press (Advances in Experimental Medicine and Biology. Volume 3), 1969. 434 p.

\$22.50.

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GNOTOBIOTICS AND HUMAN CELL CULTURE. G. E. Morre, J. W. Kullen, H. A. Franklin, and N. Kinsley (Roswell Park Memorial Institute, Buffalo, N.Y.), p. 343-356. 11 refs. (See A70-11311 01-04)

MICROBIC INTERACTIONS IN THE GNOTOBIOTIC MOUSE. M. Wagner and T. J. Starr (Notre Dame, University, Notre Dame, Ind.), p. 389-398. 5 refs. (See A70-11312 01-04)

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#### A70-11310

##### DEVELOPMENT OF IMMUNOLOGIC COMPETENCE IN GERM-FREE AND CONVENTIONAL MICE.

M. J. Bosma (Institute for Cancer Research, Philadelphia, Pa.).

IN: GERM-FREE BIOLOGY—EXPERIMENTAL AND CLINICAL ASPECTS; PROCEEDINGS OF AN INTERNATIONAL SYMPOSIUM ON GNOTOBIOLOGY, BUFFALO, N.Y., JUNE 9-11, 1968. (A70-11309 01-04)

Symposium sponsored by the Roswell Park Memorial Institute, the State University of New York, and the Association for Gnotobiotics. Edited by E. A. Mirand and Nathan Back.

New York, Plenum Press (Advances in Experimental Medicine and Biology. Volume 3), 1969, p. 249-258. 14 refs.

AEC-sponsored research.

Study of the postnatal increase of immunologic competence to sheep RBC antigen in germ-free mice. It was found that this increase was identical in germ-free and conventionally reared mice. This finding was based on an unbiased experimental test system which made it possible to relate hemagglutinin synthesis to a cellular definition of immunologic competence. G.R.

#### A70-11311

##### GNOTOBIOTICS AND HUMAN CELL CULTURE.

G. E. Moore, J. W. Kullen, H. A. Franklin, and N. Kinsley (Roswell Park Memorial Institute, Cell Laboratories, Buffalo, N.Y.).

IN: GERM-FREE BIOLOGY—EXPERIMENTAL AND CLINICAL ASPECTS; PROCEEDINGS OF AN INTERNATIONAL SYMPOSIUM ON GNOTOBIOLOGY, BUFFALO, N.Y., JUNE 9-11, 1968. (A70-11309 01-04)

Symposium sponsored by the Roswell Park Memorial Institute, the State University of New York, and the Association for Gnotobiotics. Edited by E. A. Mirand and Nathan Back.

New York, Plenum Press (Advances in Experimental Medicine and Biology. Volume 3), 1969, p. 343-356. 11 refs.

Discussion of the use of gnotobiotic techniques in cell laboratories. The use of a gnotobiotic unit for maintaining cell cultures is described. The establishment of human hematopoietic cell lines is discussed, and the transfer of one culture to another culture is considered. A number of practical problems are listed which have not been solved satisfactorily. G.R.

## A70-11312 \*

## MICROBIC INTERACTIONS IN THE GNOTOBIOTIC MOUSE.

Morris Wagner and Theodore J. Starr (Notre Dame, University, Dept. of Microbiology, Notre Dame, Ind.).

IN: GERM-FREE BIOLOGY—EXPERIMENTAL AND CLINICAL ASPECTS; PROCEEDINGS OF AN INTERNATIONAL SYMPOSIUM ON GNOTOBIOLOGY, BUFFALO, N.Y., JUNE 9-11, 1968. (A70-11309 01-04)

Symposium sponsored by the Roswell Park Memorial Institute, the State University of New York, and the Association for Gnotobiotics. Edited by E. A. Mirand and Nathan Back.

New York, Plenum Press (Advances in Experimental Medicine and Biology. Volume 3), 1969, p. 389-398. 5 refs.

Grant No. NGR-15-004-017.

Study of the fate and numerical establishment of certain pure cultures of bacteria in the intestinal tract of previously germ-free mice after oral inoculation. Bacteria-free mice were housed in Trexler-type plastic isolators and associated with pure cultures of specific bacteria to form a number of separate bacterially mono-associated mouse colonies. Progeny of these animals were studied in the monoassociated state. When animals bearing two bacterial species were used, mice from the respective monoassociated colonies were transferred and pooled in a separate isolator so that exchange of their original respective monofloras could take place. The quantitation of bacteria in the feces was done by viable plate counts using appropriate media for the quantitative recovery of each species in the mixed flora.

G.R.

## A70-11314 \*

## FAILURE OF MEN TO SELECT A BALANCED AMINO ACID MIXTURE.

Jean Bowering, Sheldon Margen, and Doris Howes Calloway (California, University, Dept. of Nutritional Sciences, Berkeley, Calif.).

*Journal of Nutrition*, vol. 99, Sept. 1969, p. 58-60. 10 refs.

PHS Grant No. AM 10202; Grant No. NGL-05-003-012.

Investigation of the capacity of humans to discriminate between poorly and well-balanced diets and their liability to select amino acid-imbalanced mixtures supplying a nutrient in which they are deficient. Examinations made in six healthy young men are described, and the results obtained are discussed. It is shown that the tests gave no indication that humans have the capacity to discriminate between amino acid mixtures on the basis of their ability to supply adequate quantities of indispensable amino acids.

O.H.

## A70-11360

## ON THE EXISTENCE OF NEURONES IN THE HUMAN VISUAL SYSTEM SELECTIVELY SENSITIVE TO THE ORIENTATION AND SIZE OF RETINAL IMAGES.

C. Blakemore and F. W. Campbell (Cambridge University, Physiological Laboratory, Cambridge, England).

*Journal of Physiology*, vol. 203, July 1969, p. 237-260. 20 refs.

Research supported by the Medical Research Council.

Study of the existence and quantitative measurement of the properties of neurons in man—i.e., elements of the visual nervous system each selectively sensitive to a limited range of spatial frequency, which encode the orientation and the dimensions of retinal images. A comparison is made with the results of the measurements of neuron properties found recently in the cat. The methods applied are described, and the test results are discussed in detail. These results suggest that the human visual system may possess neurons selectively sensitive to spatial frequency and size. The orientational selectivity and the interocular transfer of the adaptation effect implicate the visual cortex as the site of these neurons. It is shown that this neural system may play an essential preliminary role in the recognition of complex images and in generalization for magnification.

O.H.

## A70-11363

## PROTEIN METABOLISM DURING EXPOSURE TO HYPERBARIC OXYGEN.

Harry Sobel (U.S. Veterans Administration, Hospital, Aging Research Laboratory, Sepulveda; California, University, School of Public Health, Los Angeles, Calif.).

*Society for Experimental Biology and Medicine, Proceedings*, vol. 132, Oct. 1969, p. 314-317. 14 refs.

NSF Grant No. GB-6624; Contract No. N 00014-67-A-0111-0008.

Study of the protein metabolism of mice exposed for 72 hr to compression with 3 atm of an air-oxygen mixture containing 27 per cent oxygen. The mice were injected with 1 microcurie of  $^{14}\text{C}$ -lysine at the initiation, and 24 and 48 hr after compression was started. The cpm and sp act values of the protein of the carcasses were determined. The sp act values were 10, 13, and 14 per cent greater than those of the controls in the three groups. This appeared to be related to reduced food intake rather than any specific effect on nitrogen metabolism.

Z.W.

## A70-11368

## PHYSIOLOGICAL SIGNIFICANCE OF THE GEOMETRICAL SHAPE OF THE LEFT VENTRICLE—COURSE AND CURVATURE OF THE INDIVIDUAL MYOCARDIAL FIBERS.

Panagiotis C. Voukydis (Boston University, Medical Center, Dept. of Physiology, Boston, Mass.).

*Bulletin of Mathematical Biophysics*, vol. 31, June 1969, p. 383-393.

PHS Grants No. HE-10676; No. HE-05680.

Mathematical description of the course of myocardial fibers in the wall of the left ventricle. By use of this mathematical description, an equation giving the curvature of the individual myocardial fibers is derived, and numerical solutions of this equation are presented.

(Author)

## A70-11369

## A NOTE ON THE MATHEMATICAL THEORY OF THE EFFECT OF NERVOUS STRESS ON CORONARY THROMBOSIS.

N. Rashevsky (Michigan, University, Mental Health Research Institute, Ann Arbor, Mich.).

*Bulletin of Mathematical Biophysics*, vol. 31, June 1969, p. 403-416. 10 refs.

PHS Grant No. GM-12032.

Derivation of mathematical relations describing the effect of nervous stress on coronary thrombosis, assuming that either a breakdown or an injury of a platelet produces thrombokinase. It is pointed out that an injury is likely to occur due to collisions between platelets, between platelets and erythrocytes, or between platelets and leukocytes. A probability is ascribed to the production of thrombokinase by a collision. Not every collision is effective. The frequency of the collisions is calculated according to classical physics. Inasmuch as mental stress usually causes vasoconstriction and therefore an increase of concentration of the formed elements of blood, the frequency of collisions and therefore the production of small amounts of thrombokinase increase with stress. If thrombokinase formed by the collision remains preserved and therefore accumulates in the blood, an expression can be obtained which gives the total duration of stress necessary to produce thrombosis. The outline of a biochemical approach is also given.

G.R.

## A70-11370

## A TWO COMPARTMENT MODEL FOR CELL SURVIVAL AFTER IRRADIATION WITH IONIZING RADIATION.

P. C. Gupta (Institute of Nuclear Medicine and Allied Sciences, Delhi, India).

*Bulletin of Mathematical Biophysics*, vol. 31, Mar. 1969, p. 1-8. 5 refs.

Description of a theory of cell survival after irradiation, considering the cell as composed of two compartments with different sensitivities and taking into account recovery phenomena. Expressions are obtained for the probabilities that the cell will be in a survival state or damaged state or that it will function with reduced efficiency. (Author)

## A70-11371 \*

## THE TIME-VARYING ELASTIC PROPERTIES OF THE LEFT VENTRICULAR MUSCLE.

Dhanjoo N. Ghista (NASA, Ames Research Center, Moffett Field, Calif.) and H. Westcott Vayo (Toledo, University, Mathematics Dept., Toledo, Ohio).

*Bulletin of Mathematical Biophysics*, vol. 31, Mar. 1969, p. 75-92. 7 refs.

Combination of two techniques in order to discuss the time-varying elastic properties of the left ventricular muscle. An analytic model for the shape and forces in the left ventricle is combined with the Fourier series representations of certain ventricular dimensions and pressure to derive expressions for the stress and strain in the left ventricle. The strain is thus a function of the elastic material properties, which are then expressed as functions of time by using Fourier series. The only data needed for a numerical study using these techniques are closed-chest determinations of the ventricular dimensions and the ventricular pressure. F.R.L.

## A70-11372

## ESTIMATION OF AORTIC DISTENSIBILITY AND INSTANTANEOUS LEFT VENTRICULAR VOLUME IN LIVING MAN.

M. F. Conroy (Harvard University, Harvard Medical School, Dept. of Medicine; Peter Bent Brigham Hospital, Boston, Mass.).

*Bulletin of Mathematical Biophysics*, vol. 31, Mar. 1969, p. 93-104. 7 refs.

PHS Grants No. GM-984-05; No. GM-14938-01.

Description of a method for the estimation of aortic distensibility and instantaneous systolic left ventricular volume in living man in the absence of valvular regurgitation. The method is based on a simple, elastic-reservoir theory, model of the circulatory system and requires no assumption concerning the geometry of the left ventricle. The input data required for this mathematical model consist of stroke volume, an aortic pressure record over an entire cardiac cycle, and end diastolic ventricular volume. The procedure developed here for the estimation of aortic distensibility and instantaneous left ventricular volume is very practical from a computational point of view. It is believed that it will yield useful information concerning two clinically important quantities which cannot be measured directly in living man and will facilitate the study of correlations between these quantities and various physiological and pathological states. Results are presented for six cardiac patients. (Author)

## A70-11373

## THE LEFT VENTRICLE AS CONFOCAL PROLATE SPHEROIDS.

Jean-Marie Dieudonné (Montreal, University, Dept. of Physiology, Montreal, Canada).

*Bulletin of Mathematical Biophysics*, vol. 31, Sept. 1969, p. 433-439. 9 refs.

Research supported by the Quebec Heart Foundation and the Medical Research Council.

Description of a model of the left ventricle which takes into account the physiologic variations of thickness (a function of time and distance prior to and during ejection) by assuming that the prolate spheroids are confocal at a given instant. The hyperbolic segment of arc between innermost and outermost spheroids, confocal

with the latter, defines a so-called functional thickness, for which a derivation is given. Results show that this model operates in a range of eccentricity wherein thickness change per unit internal volume change is greatest. (Author)

## A70-11374

## BIOLOGICAL AGING AS A DIFFUSION PHENOMENON.

Donald G. Carpenter (U.S. Air Force Academy, Dept. of Physics, Colorado Springs, Colo.).

*Bulletin of Mathematical Biophysics*, vol. 31, Sept. 1969, p. 487-504. 21 refs.

The general cross-linkage theory of biological aging is pointed out to consist of two distinct branches: mutation theory and diffusion theory. Only diffusion theory is considered, however, and it is expressed as a sum of terms. One of those terms is expressed in differential equation form, and the complete mathematical solution to it is obtained under certain limiting assumptions. An approximation to the complete solution is applied to four distinct cases involving (1) rat tendon collagen, (2) cellular waste products in humans, (3) collagen in humans, and (4) lipofuscins in the human myocardium. (Author)

## A70-11375

## CHIMPANZEE: CENTRAL NERVOUS SYSTEM AND BEHAVIOR; A REVIEW.

Edited by H. H. Reynolds (USAF, Aeromedical Research Laboratory, Holloman AFB, N. Mex.).

Basel, Switzerland, S. Karger AG (Primates in Medicine. Volume 4), 1969. 167 p. \$9.35.

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FOREWORD. C. H. Kratochvil (USAF, Aeromedical Research Laboratory, Holloman AFB, N. Mex.), p. VI-VIII.

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SOME RESEARCH TECHNIQUES APPLICABLE TO STUDY OF THE CHIMPANZEE NERVOUS SYSTEM. D. F. Buxton (Arkansas, University, Little Rock, Ark.), M. L. Reite (Colorado, University, Denver, Colo.), and W. J. Jackson (USAF, Aeromedical Research Laboratory, Holloman AFB, N. Mex.), p. 52-61.

CHIMPANZEE PSYCHOBIOLOGY. H. H. Reynolds and D. N. Farrer (USAF, Aeromedical Research Laboratory, Holloman AFB, N. Mex.), p. 62-93.

APPARATUS FOR PSYCHOBIOLOGICAL RESEARCH. G. L. Wilson (USAF, Aeromedical Research Laboratory, Holloman AFB, N. Mex.) and M. E. Grunzke (USAF, Personnel Headquarters, Washington, D.C.), p. 94-153.

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## A70-11380

## AERONAUTICAL AND ASTRONAUTICAL PHYSIOPATHOLOGY AND PATHOLOGY (PHYSIOPATHOLOGIE ET PATHOLOGIE AERONAUTIQUES ET COSMONAUTIQUES).

L. Tabusse and R. Pannier (Armée de l'Air, Corps de Santé, Paris, France).

Paris, Editions Doin-Deren et Cie., 1969. 397 p. In French. \$22.80.

A treatise on the specific aeronautical and astronautical pathology connected with the stressful factors of flying, high speed, and altitude, is offered to aeronautical physicians, particularly those engaged in the selection and medical and physiological supervision of

flying personnel. The physiological problems are dealt with from the standpoint of aeronautical experimental medicine. Physiopathological problems posed by aircraft flying are discussed, and the various fields of aeronautical pathology are reviewed. Some of the subjects treated are the pathology of hypoxia and atmospheric vacuum; the pathology of cold and heat in aviation; the physiopathological effects of high speeds; the medical problems posed by high altitude; the pathology of vibrations and automatic ejections; air sickness; sickness and blackouts during flight; cardiovascular afflictions; afflictions of the respiratory tract; digestive, metabolic and endocrinal afflictions; kidney, urinary, blood and neurophysiological afflictions; eye problems; aviation fatigue and hygiene; air accidents; and the physiopathology of space flight. M.M.

## A70-11381

## FUNDAMENTALS OF RADIATION PROTECTION.

H. F. Henry (DePauw University, Dept. of Physics, Greencastle, Ind.).

New York, Wiley-Interscience, 1969. 501 p. 11 refs. \$17.50.

An attempt is made to introduce the reader not only to the technical aspects of radiation protection, including its physical and biological bases, but also to describe briefly the principles that will guide the implementation of a radiation-protection program. Basic information concerning the atomic structure is presented, and nuclear transformations, radioactivity, and fission are discussed. The general effects of radiation on biological cells are examined, and physical aspects of radiation exposure are described. Cases of radiation exposures are considered. The effects of acute total-body radiation exposures are investigated, and long-term somatic and genetic effects of radiation are discussed. Permissible exposure limits, internal exposure evaluations, and radiation detection are considered. The principles of personnel and of environmental monitoring are presented. Ways for reducing radiation intensity are described. Aspects of off-site monitoring and plant emergencies are discussed. Administrative methods geared to the protection of personnel from potential radiation injury are considered. The dangers of nuclear weapons are discussed. The benefits obtainable from radiation are described. G.R.

## A70-11401 #

## RADIOLOGIC EXAMINATION OF RESPIRATORY FUNCTION OF THE LUNGS BY MEANS OF A PERSONALLY DEvised INSTRUMENT.

Bazyli Żamojda (Medical Academy, Dept. of Radiology, Białystok, Poland).

(*Polski Przegląd Radiologii i Medycyny Nuklearnej*, vol. 32, no. 4, 1968.)

*Polish Review of Radiology and Nuclear Medicine*, vol. 32, no. 4, 1968, p. 395-402. 16 refs.

Discussion of an instrument and a radiological method for studying the respiratory function of the lungs. Conditions are studied at the peak of deep inspiration, at the peak of deep expiration, and in the resting phase. The instrument described is made of aluminum and consists of a housing, clamps for suspending it on the screen of the X-ray apparatus, two pairs of parallel tube guides for the holders of the cassette and grid, six 3-V electric bulbs, two switches, two battery chambers, two 4.5-V batteries, and a grid with 9-mm slits made of 2-mm-thick strips of lead foil, 18 mm wide and 360 mm long. The technique of making the radiograms is discussed, and examples of the calculation of pulmonary vital capacity and other parameters are presented. G.R.

## A70-11402 #

## THE INFLUENCE OF TOPICALLY ADMINISTERED VITAMIN A ON POSTRADIATION REACTIONS IN HUMAN SKIN.

Bogumiła Szymczykowa (Silesian Medical Academy, Dermatological Clinic, Zabrze, Poland).

(*Polski Przegląd Radiologii i Medycyny Nuklearnej*, vol. 32, no. 4, 1968.)

*Polish Review of Radiology and Nuclear Medicine*, vol. 32, no. 4, 1968, p. 495-501. 17 refs.

Study of the effect of topically administered vitamin A on postradiation reactions of the skin in a group of 15 patients. An ointment containing vitamin A was rubbed daily into the skin on the back of a patient. After six days the patient's back was X-irradiated. It was found that there was an unquestionable influence of vitamin A on the course of the postradiation reaction. G.R.

## A70-11403 #

STUDIES ON THE OSTEOTROPIC PROPERTIES OF RADIOACTIVE CHROMIUM (<sup>51</sup>Cr). I.

Jerzy Marian Wojciechowski (Medical Academy, Dept. of Radioisotopes, Warsaw, Poland).

(*Polski Przegląd Radiologii i Medycyny Nuklearnej*, vol. 32, no. 4, 1968.)

*Polish Review of Radiology and Nuclear Medicine*, vol. 32, no. 4, 1968, p. 502-512. 39 refs.

Investigation of the osteotropic properties of chromium 51 and of the possibilities of using this isotope in studies of the osseous system. Experiments were performed with about 200 rats and 15 rabbits, on 679 different bone groups and on soft tissues. Sites of binding of the isotope in bones and the affinity of the isotope for mineral substances were investigated. Both quantitative and qualitative comparisons were made of the uptake of chromium by bone and other tissues. Observations were also made on the uptake of chromium 51 *in vitro*, relations between chemical forms of the element and its accumulation in different tissues, and uptake by healthy and pathological bones. A comparison was made between chromium 51 and other osteotropic elements. The advantages of using chromium 51 in the diagnosis of the osseous system in humans are cited. G.R.

## A70-11404 #

## ANALYSIS OF RESOLVING POWER IN MEASUREMENTS OF RADIOACTIVITY WITH THE ANGER SCINTICAMERA.

Jan Malesa (Institute of Oncology, Dept. of Physics, Warsaw, Poland).

(*Polski Przegląd Radiologii i Medycyny Nuklearnej*, vol. 32, no. 4, 1968.)

*Polish Review of Radiology and Nuclear Medicine*, vol. 32, no. 4, 1968, p. 520-527.

Discussion of experiments with the Anger scinticamera, carried out in order to study the resolving power of the device in measurements of radioactivity. The mathematical principle of division of radioisotope concentration for measurements with the scinticamera is discussed, and the experiments are described. It is shown that a mathematical, not visual, analysis of the measurements is necessary to ensure unambiguous interpretation of the results obtained with the scinticamera. G.R.

## A70-11405 #

## INVESTIGATIONS ON THE ADRENAL FUNCTION IN ACUTE MYOCARDIAL INFARCTION.

M. Markiewicz (Medical Academy, Dept. I of Internal Diseases, Lublin, Poland).

(*Polski Tygodnik Lekarski*, vol. 23, no. 17, 1968.)

*Polish Medical Journal*, vol. 8, no. 2, 1969, p. 268-272. Translation.

Investigation of the adrenal function in 100 patients with acute myocardial infarction. In these investigations, two groups of patients were differentiated: patients with good prognosis, and patients with poor prognosis. It was observed that in the acute period of myocardial infarction, the adrenal function is increased in a high percentage of cases (about 80 per cent). Moreover, the adrenal function is significantly increased during the first two days and then gradually returns to normal with healing of the impact. Finally, the adrenal function is found to be less elevated in infarction with good prognosis than in patients with poor prognosis. O.H.

#### A70-11406 #

##### PICTURE OF KERATINOCYTES AFTER SKIN IRRADIATION WITH ULTRAVIOLET RAYS.

J. A. Szadurski (Railway Health Service, Main Research Center, Dept. of Dermatology, Warsaw, Poland).

(*Przegląd Dermatologiczny*, vol. 55, no. 6, 1968.)

*Polish Medical Journal*, vol. 8, no. 2, 1969, p. 494-496. 13 refs. Translation.

Examination of processes of keratinocytes developed in a female patient following skin ultraviolet irradiation with a quartz lamp for cosmetic purposes. As early as on the fourth day, and especially distinctly on the eighteenth day after irradiation, keratinocytes of the epidermal surface were found to exhibit changes evidencing an incomplete reconstruction of formed cell elements in the course of the process of keratinization. It is concluded that these changes, visible in preparations of Gram-stained epidermal strippings, probably occur as a result of a shortening of the time of passage of the cells from the germinative layer to the skin surface. O.H.

#### A70-11450 \*

##### MIXED-GAS ADSORPTION AND VACUUM DESORPTION OF CARBON DIOXIDE ON MOLECULAR SIEVE.

Luino Dell'Osso, Jr. (NASA, Manned Spacecraft Center, Houston, Tex.), Joseph M. Ruder, and Jack Winnick (Garrett Corp., AiResearch Manufacturing Co., Los Angeles, Calif.).

*I & EC—Industrial and Engineering Chemistry, Process Design and Development*, vol. 8, Oct. 1969, p. 477-482.

Description of a molecular sieve carbon dioxide-removal system constructed to maintain an Apollo spacecraft cabin at a carbon dioxide partial pressure below 7.6 mm Hg for at least 45 days with a carbon dioxide-removal rate equal to the production rate of three men. A closed chamber test was conducted for 48 days, during which time the system performed according to specification. Analytical techniques developed in connection with the system development accurately described system performance under normal and accelerated operating conditions. (Author)

#### A70-11458

##### DYNAMIC TESTING SYSTEM FOR OXYGEN BREATHING EQUIPMENT.

*SAE Aerospace Recommended Practice, ARP 1109*, Apr. 1, 1969. 6 p.

Discussion of a recommended practice aimed at establishing a system of instrumentation for dynamic testing of breathing oxygen demand regulators and demand-regulator mask and hose assemblies. The discussion includes the equipment and procedure to be used, at all appropriate altitudes, in testing breathing oxygen systems consisting of a demand regulator, connecting hose, and mask, or regulator and helmet systems, or individual components. By simulating the human breathing capabilities, dynamic testing ensures the reliability and stability of crew oxygen breathing systems. V.P.

#### A70-11463 #

##### APPRAISAL OF THE CURRENT STATE OF THE DEVELOPMENT OF THE CONCEPT OF CORTICOVISCERAL INTERRELATIONS (K KHARAKTERISTIKE SOVREMENNOGO ETAPA V RAZVITII KONTSEPTSII O KORTIKO-VISTSERAL'NYKH VZAIMOOTNOSHENIIAKH).

V. N. Chernigovskii (Akademiia Nauk SSSR, Institut Fiziologii, Laboratoriia Obshchei Fiziologii Retseptsi, Leningrad, USSR).

*Fiziologicheskii Zhurnal SSSR*, vol. 55, Aug. 1969, p. 904-911. 9 refs. In Russian.

Review of studies concerning the current state of the concept of corticovisceral interrelations initiated by Bykov (1926, 1928). According to this concept the cortex receives information concerning the condition of internal organs; this information then becomes part of the general conditioned-reflex activity and in some cases may have feedback properties. More recent contributions to this concept are summarized in the form of a diagram indicating the interactions between cortical and nervous activity of various organs. V.Z.

#### A70-11464 #

##### PROBLEM OF ARTIFICIAL HYPOBIOSIS (PROBLEMA ISKUS-STVENNOGO GIPOBIOZA).

V. V. Parin and N. N. Timofeev (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR).

*Fiziologicheskii Zhurnal SSSR*, vol. 55, Aug. 1969, p. 912-919. 16 refs. In Russian.

Consideration of possible approaches to the problem of obtaining and maintaining a state of reduced vital activity (artificial hypobiosis) in animals based on a review of some published studies. Discussed specifically is a study of artificial hypobiosis in groups of 70 dogs, 18 cats, 80 rabbits, and more than 1000 rats exposed to cooling at ambient temperatures down to -10 deg C after the administration of lytic mixtures suppressing the oxidation processes. The results of this study are summarized in the form of a diagram indicating the various types of vital activity suppression obtained in experiments. V.Z.

#### A70-11465 #

##### PROBLEMS OF PHYSIOLOGICAL ADAPTATION AND BEHAVIOR IN ECOLOGICO-PHYSIOLOGICAL STUDIES (PROBLEMY FIZIOLOGICHESKOI ADAPTATSII I POVEDENIIA V EKOLOGO-FIZIOLOGICHESKIKH ISSLEDOVANIIAKH).

A. D. Slonim (Akademiia Nauk SSSR, Sibirskoe Otdelenie, Institut Fiziologii, Novosibirsk, USSR).

*Fiziologicheskii Zhurnal SSSR*, vol. 55, Aug. 1969, p. 920-928. 54 refs. In Russian.

Brief review of the current trends in published studies concerning the physiological adaptation and behavioral features of man and animals under conditions of polar regions, highland, and arid areas. Among the topics mentioned are Soviet studies dealing with the ecological adaptation of a total of roughly 300 species of wild and domestic animals; ecologico-physiological studies of the effects of resettlement on man; investigations of the effect of vitamins on the hibernation process; studies of the physiological aspects of wildlife migration; and studies and theories concerning the imprinting reflexes in animals. V.Z.

#### A70-11466 #

##### EFFECT OF THE ILLUMINATION CONDITIONS OF THE ANT-ARCTIC CONTINENT ON THE STATE OF THE AUTOMATIC CONTROL FUNCTIONS OF THE HUMAN CEREBRUM (VLIANIE SVETOVOGO REZHIMA ANTARKTICHESKOGO KON-TINENTA NA SOSTOIANIE AVTOREGULIATORNYKH FUNK-TSII GOLOVNOGO MOZGA CHELOVEKA).

P. V. Bundzen (Akademiia Meditsinskikh Nauk SSSR, Institut Eksperimental'noi Meditsiny, Laboratoriia Neirokibernetiki, Leningrad, USSR).

*Fiziologicheskii Zhurnal SSSR*, vol. 55, Aug. 1969, p. 929-939. 19 refs. In Russian.

Results of an electroencephalographic investigation of the cerebral biocurrents (alpha activity level) in a group of ten members of the Novolazarevskaya station in Queen Maud Land during a polar night-and-day cycle. It is concluded that the customary diurnal and seasonal light exposure conditions are an important ecological factor determining the functioning of the nonspecific automatic control mechanisms of the central nervous system. It is found that the changes in the automatic control functions of the central nervous system observed under the extreme conditions of the Antarctic are accompanied by a temporally depressed reliability of the performance of an operator's duties and may lead to the occurrence of microsymptoms of higher nervous activity disorders. V.Z.

#### A70-11467 #

MECHANISMS OF FORMATION OF THE FUNCTIONAL ACTIVITY OF THE CONTROL SYSTEMS OF THE CEREBRUM OF A HUMAN OPERATOR IN A PROBABILITY MEDIUM (O MEKHANIZMAKH FORMIROVANIIA FUNKTSIONAL'NOI AKTIVNOSTI REGULIATORNYKH SISTEM GOLOVNOGO MOZGA CHELOVEKA-OPERATORA V VEROIATNOSTNOI SREDE).

A. M. Zingerman (Akademiia Meditsinskikh Nauk SSSR, Institut Eksperimental'noi Meditsiny, Laboratoriia Sravnitel'noi Fiziologii i Patologii, Leningrad, USSR).

*Fiziologicheskii Zhurnal SSSR*, vol. 55, Aug. 1969, p. 940-947. 18 refs. In Russian.

Study of reactions to visual emergency signals in several groups of five subjects after administration of adrenalin, aminazine, melipramine, or andaxine intended to change the functional state of the control systems of the cerebrum. The subjects were instructed to press a button liquidating the emergency situation when they saw an emergency signal indicated by a hand on a dial. The time of their motor reaction, the electrical resistance of the skin, as well as EKGs and pneumograms, were recorded during the experiments. Simultaneously with a visual emergency signal, the subjects also received a painful electrical pulse in the skin prompting their motor reaction. Adrenalin and melipramine are found to stimulate reactivity, while aminazine and andaxine produce distorted paradoxical effects. V.Z.

#### A70-11468 #

TRACING PROCESSES AND CELLULAR MEMORY MECHANISMS (SLEDOVYE PROTSESSY I KLETOCHNYE MEKHANIZMY PAMIATI).

N. N. Vasilevskii and S. I. Soroko (Akademiia Meditsinskikh Nauk SSSR, Institut Eksperimental'noi Meditsiny, Leningrad, USSR).

*Fiziologicheskii Zhurnal SSSR*, vol. 55, Aug. 1969, p. 957-965. 16 refs. In Russian.

Study of the tracing activity of a total of 49 neurons in the cortical projection region of the cutaneous analyzer of a group of immobilized rabbits, with special attention devoted to the tracing activity rhythms. Neuron responses are stimulated by an electric acoustic vibrator; inserted glass microelectrodes are used for recording the extracellular potential peaks of the neurons. The occurrence of the so-called EEG tracer intervals after stimulation is discussed. V.Z.

#### A70-11469 #

CERTAIN ECOLOGICAL FEATURES OF THE NEURON ORGANIZATION IN CORTICAL ANALYSIS OF VISUAL AND ACOUSTIC SIGNALS (NEKOTORYE EKOLOGICHESKIE OSOBENNOSTI NEIRONNOI ORGANIZATSII KORKOVOGO ANALIZA ZRITEL'NYKH I SLUKHOVYKH SIGNALOV).

A. B. Kogan (Rostovskii-na-Donu Gosudarstvennyi Universitet, Kafedra Fiziologii Cheloveka i Zhivotnykh, Rostov, USSR).

*Fiziologicheskii Zhurnal SSSR*, vol. 55, Aug. 1969, p. 966-970. 10 refs. In Russian.

Study of the responses of cortical neurons to light signals and acoustic signals in groups of rabbits and cats, by using microelectrodes inserted at different depths into the cortex. It is found that an inhibition reaction of neurons to visual and acoustic signals prevails in both rabbits and cats at an electrode depth of 1000 microns. The effects of ecological factors on these responses in cats and rabbits are discussed. V.Z.

#### A70-11470 #

EFFECT OF THE SEVERANCE OF INTRACORTICAL CONNECTIONS ON THE NEURON ACTIVITY IN THE SOMATOSENSORY REGION OF THE CORTEX (VLIANIE PERERYVA VNUTRIKORKOVYKH SVIAZEI NA AKTIVNOST' NEIRONOV SOMATOSENSORNOI ZONY KORY).

T. P. Shliafer (Akademiia Meditsinskikh Nauk SSSR, Institut Eksperimental'noi Meditsiny, Otdel Sravnitel'noi Fiziologii, Leningrad, USSR).

*Fiziologicheskii Zhurnal SSSR*, vol. 55, Aug. 1969, p. 971-976. 16 refs. In Russian.

Study of the neuron activity in the somatosensory region of the cortex of groups of guinea pigs and rats with intracortical connections severed by circular incision. The functional mobility of cortical neurons, the numbers of active neuron cells, and the phonon pulsation frequencies were lower in experimental animals than in control animals. The effects of the auditory system via intracortical tracts on the somatosensory neurons of the cortex were found to be stronger in rats than in guinea pigs. V.Z.

#### A70-11471 #

ANALYSIS OF THE FUNCTIONAL ORGANIZATION OF A "SPINAL VASOMOTOR CENTER" (ANALIZ FUNKTSIONAL'NOI ORGANIZATSII "SPINAL'NOGO VAZOMOTORNOGO TSENTRA").

A. V. Val'dman, G. V. Kovalev, and V. A. Tsyrlin (I Meditsinskii Institut, Kafedra Farmakologii, Leningrad, USSR).

*Fiziologicheskii Zhurnal SSSR*, vol. 55, Aug. 1969, p. 1010-1019. 23 refs. In Russian.

Study of the vasomotor activity of neurons located in the lateral crescent of the spinal cord, in a total of 85 experiments on curarized decerebrated and intact cats, after administration of nembutal, dehydroergotoxin, aminazine, morphine, amizil, and scopolamine. The results suggest that some of the neurons of this group exert an inhibitory effect on the vasomotor system of cats. V.Z.

#### A70-11474

TIME SENSE IN ISOLATION.

P. M. van Wulfften Palthe.

*Psychiatria, Neurologia, Neurochirurgia*, vol. 71, 1968, p. 221-241. 10 refs.

Investigation of the time estimation of various groups of subjects kept in maximum isolation in a caisson for about an hour or in caves for several months. Time sense is found to be a function of upper brain stem paraconsciousness. Its estimation of time span is

given intuitively without reasoning and is moved by an inner certainty in the absence of nearly total external information. In "one hour" experiments of extreme isolation and solitary confinement, the estimate oscillates steadily around 60 per cent of real time. In cave experiments lasting several months the situation was less extreme, but the estimates by the alternating "cortical and brain stem consciousness" show an average of 60 per cent of real time; however, the estimates of the time span after a sleep period differ considerably from those following a period of activity and with a lesser dispersion range. The terrestrial 24-hr rhythm is intrinsically present in the estimates. Estimation falls considerably short of real time; hence duration seems unexpectedly long. F.R.L.

## A70-11647

## THE QUANTITATIVE ASSESSMENT OF THERMAL DISCOMFORT.

Joseph C. Stevens, Lawrence E. Marks, and A. Pharo Gagge (John B. Pierce Foundation, Laboratory; Yale University, New Haven, Conn.). *Environmental Research*, vol. 2, Apr. 1969, p. 149-165. 34 refs. NIH Grant No. OH-00179; Contract No. AF 44(620)-67-C-0017.

Discomfort aroused by lowering or raising the operative temperature of a subject's environment was found to follow the "power law" that governs many dimensions in the domain of sensory psychophysics. To a first approximation, discomfort caused by cooling grows as the 1.7 power of shifts downward in temperature from the level that feels comfortable; discomfort caused by heating grows as the 0.7 power of shifts upward from the level that feels comfortable. One group of 8 subjects matched numbers to the degree of discomfort (magnitude estimation); another group of 12 subjects adjusted the loudness of a white noise to match the discomfort (cross-modality matching). These verbal and nonverbal methods gave approximately the same result with regard to the quantification of thermal discomfort. (Author)

## A70-11648 \*

## COMFORT AND THERMAL SENSATIONS AND ASSOCIATED PHYSIOLOGICAL RESPONSES DURING EXERCISE AT VARIOUS AMBIENT TEMPERATURES.

A. P. Gagge, J. A. J. Stolwijk, and B. Saltin (John B. Pierce Foundation, Laboratory; Yale University, New Haven, Conn.). *Environmental Research*, vol. 2, Apr. 1969, p. 209-229. 26 refs. NIH Grant No. UI-00426; Contract No. NAS 9-7140.

Discussion of sensory estimates based on nominal scales, which were made by four healthy male subjects dressed in shorts while pedaling a bicycle ergometer at 25, 50, and 75 per cent maximal oxygen uptake and at 10, 20, and 30 deg C ambient air temperature. After 30 to 40 min of steady exercise, temperature sensations ranging from cool to hot are principally related to skin and ambient air temperatures and are unrelated to metabolic rate, muscle, and rectal temperatures. Warm discomfort is principally related to skin sweating and skin conductance and is affected either by air temperature and metabolism or by both skin and rectal temperature. It thus appears that during steady-state exercise, the judgment of temperature is dominated by sensor mechanisms in the skin, and that warm discomfort is principally governed by thermoregulatory effector mechanisms. During thermal transients caused by the rise in metabolic energy with the start of exercise, both comfort and temperature sensation are related to the initial rise in mean body temperature. M.M.

## A70-11649

## THE RESPIRATORY MASS SPECTROMETER.

K. T. Fowler (Sydney, University, Dept. of Medicine, Biophysics Laboratory, Sydney, Australia). *Physics in Medicine and Biology*, vol. 14, Apr. 1969, p. 185-199. 16 refs.

Examination of some of the specifications to be met by mass spectrometers for use in respiratory research and clinical investigation. Attention is drawn to the more important design requirements. Manufacturers should provide a sampling system free of the errors associated with a change of viscosity and water vapor content in the sample. The gas flow regime through the ionizing region of the vacuum system must be similarly independent of viscosity changes and should respond to changes in gas composition within the required response time. Electronic circuitry should be redesigned into replaceable solid state blocks, with a fault-finding system which can be successfully used by those without electronic skills. High vacuum pumps, must be able to operate without producing source contamination, and should not require the daily replenishment of cold traps. The mechanical design of the ion source and the jiggling system must be such that it may be stripped, cleaned, and reassembled by comparatively unskilled persons. M.M.

## A70-11666

## FROM MOLECULE TO MARS.

Melvin Calvin (California, University, Laboratory of Chemical Dynamics, Berkeley, Calif.).

*Royal Institution of Great Britain, Proceedings*, vol. 42, no. 197, 1969, p. 253-278.

Discussion of the evolution of the earth and other planets of the solar system from their early primitive stages of existence, in the light of Darwin's theory. A possible sequence of events is suggested resulting in the present character of the earth. Starting from the primeval atmospheric molecules, the effects of various energy inputs on this primitive reduced atmosphere (such as ultraviolet light, lightning, electrical discharge, vulcanism, radioactivity, etc.),

resulting in the production of monomers, are considered. In this model, the monomers then grow into polymers, which by autocatalysis produce some selective sequencing. Specific sequences, because of the particular structures they engender, aggregate into information-bearing (nucleic acid) and catalytic (amino acid) materials. To determine whether evolution actually occurred, or is occurring, in this manner, evidences of the same type of process at some earlier period of its evolution must be looked for in space. Recent findings from various space probe missions and some astronomical observations are reviewed. O.H.

## A70-11675

## A DOCTOR IN ORBIT.

Boris Yegorov.

*World Health*, May 1969, p. 18-23.

Transcript of an interview with Yegorov, the first physician to participate in a space flight. A large amount of research performed during the flight involved the recording of ECGs, EEGs, muscular effort, and movement of the eyeballs. Changes in blood pressure were also taken, together with a number of blood samples for analysis on earth. Psychological and character reactions were studied as they were taking place, as well as any changes affecting vision. Biological experiments were particularly oriented toward the future, when space voyages will be much longer. Efforts were made to study changes in the genetic structures of organisms under conditions of weightlessness, using plants and, above all, the drosophila fly. M.M.

## A70-11683 \*

## BROWN FAT—REGULATORY FUNCTION AND CONTROL.

Robert Em. Smith (California, University, School of Veterinary Medicine, Dept. of Physiological Sciences, Davis, Calif.).

*New Jersey Academy of Science, Bulletin*, Mar. 1969, p. 93-100. 47 refs.

PHS Grants No. HD-01826; No. HD-03268; Grant No. NGR-05-004-035.

Discussion of the thermoregulatory function and physiological control of brown fat in mammals. The possible physiological control mechanism for heat production from brown fat is discussed. The biochemical basis for the stimulation of the brown fat metabolism is examined. Z.W.

## A70-11684

## CRITERIA OF PILOT SELECTION (KRITERIEN DER PILOTEN-AUSWAHL).

K. Steininger (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany). *Wehrkunde*, vol. 18, Feb. 1969. 7 p. In German. (DVL-892)

Discussion of objectives, scientific foundations, and criteria of pilot selection. The importance of the selection of suitable persons as pilots is discussed in the light of data concerning the causes of accidents. Relations of measurable variables of personality and their distribution among the population are examined as a basis for a scientifically oriented selection procedure. The qualifications desirable for a pilot are investigated, and the compatibility of conflicting character traits is evaluated. Existing test procedures are critically examined, and some suggestions are made for improved selection methods. G.R.

## A70-11685

## CHEMICAL EVOLUTION: MOLECULAR EVOLUTION TOWARDS THE ORIGIN OF LIVING SYSTEMS ON THE EARTH AND ELSEWHERE.

Melvin Calvin.

New York, Oxford University Press, 1969. 292 p. 262 refs. \$3.50.

A study of chemical evolution of life is presented in which life is assumed to be a result of the normal operation of the laws of physics and chemistry. This implies a transition period between a nonliving molecular population on the earth's surface and a living population of molecular aggregates. Special attention is given to determine the nature of that transition, using two approaches: (1) looking back into the historical record, and (2) constructing hypothetical chemical systems that could give rise to living organisms. First, the Precambrian sediments in which the first fossils were detected are examined. An attempt is made to confirm these morphological microfossils as true biological residues by chemical methods. Since hydrocarbons are the most stable group of compounds, they are used for ascertaining that period of time when abiological organic material was present simultaneously with that produced by living things. For this purpose, the nature of the hydrocarbons in microorganisms is examined and is compared with that of organic residues of ancient sediments. An examination of ancient rocks is made, taking into consideration those more than 1000 million years old in which microfossils are present. The possible chemical evolution of life from small molecules is examined. Further discussion of the stages of this evolution includes: (1) the growth of molecules—i.e., the generation of polymeric materials, (2) the participation of the effect of catalytic function and the evolution of catalytic function and reflexive catalysis, (3) the problem of structural self-assembly of macromolecules, and (4) the evolution of chemical systems, followed by three stages in which these chemical systems are concentrated and isolated into small compartments (membranes) and a general structure of living cells appears. The application of these notions to the exploration of the nearest planets and the moon is discussed. Z.W.

## A70-11694

## TELEMETRY IN THE STUDY OF THE HEART IN ATHLETES. I, II.

Kenneth D. Rose (Nebraska, University, Div. of Medical Research,

Lincoln, Neb.).

IN: AMERICAN ACADEMY OF ORTHOPAEDIC SURGEONS, SYMPOSIUM ON SPORTS MEDICINE, OKLAHOMA CITY, OKLA., AUGUST 1967, PROCEEDINGS.

St. Louis, Mo., C. V. Mosby Co., 1969, p. 37-61. 33 refs. PHS Grant No. HE-06402.

Consideration of radiotelemetry, the technique of broadcasting physiological signals from an ambulatory subject to a distant receiving and recording complex, as a means of studying the heart of an athlete during active participation in sport. The significant incidence of death in sports participants directly attributable to heart failure, usually a fatal arrhythmia, suggests that more thought be given to this aspect of sports medicine. Acute, strenuous physical stress is attended by a marked but transient increase in serum potassium, a marked and relatively persistent increase in serum calcium, a marked metabolic acidosis, a rapidly shifting increase in p-carbon dioxide, and modifications in QRS and QT intervals and T-wave amplitudes consistent with electrolyte shifts. It is suggested that such rapid electrolyte variations might, under certain circumstances, render the myocardium and cardiac conduction mechanism more vulnerable to a fatal arrhythmia. F.R.L.

## A70-11701

## EFFECT OF HYPERBARIC OXYGENATION ON LEFT VENTRICULAR FUNCTION.

J. Michael Kioschos, Victor S. Behar, Herbert A. Saltzman, Howard K. Thompson, Nelson E. Myers, Wirt W. Smith, and Henry D. McIntosh (Duke University, Medical Center, Dept. of Medicine, Durham, N.C.).

*American Journal of Physiology*, vol. 216, Jan. 1969, p. 161-166. 19 refs.

Research supported by the John A. Hartford Foundation and the Life Insurance Medical Research Foundation; PHS Grants No. HE-07896; No. HE-5562; No. HE-5663; No. H-4807; No. HTS-5369.

Hyperbaric oxygenation (OHP) results in a decreased cardiac output, reflecting a reduction both of heart rate and stroke volume. To evaluate the mechanisms by which OHP influences cardiac performance, several indices of myocardial contractility were measured in 11 anesthetized dogs at a constant controlled ventricular rate one to three weeks after surgical induction of complete atrioventricular block. At 3.6 atmospheres absolute of oxygen pressure with an average arterial oxygen pressure of 2372 (plus or minus 109) mm Hg, means decreased significantly for stroke volume, for stroke work, and for dP/dt, while isometric contraction time increased. Filling pressure and afterload (aortic pressure) did not change significantly. The data suggest that the decrease in stroke volume and work, observed during exposure to OHP, is due to a decrease of myocardial contractility. (Author)

## A70-11702

## CORONARY VASODILATOR RESPONSES TO HYPOXIA AND INDUCED TACHYCARDIA BEFORE AND AFTER LIDOFLAZINE.

Skoda Afonso (Wisconsin, University, Medical School, Cardiovascular Research Laboratory, Madison, Wis.).

*American Journal of Physiology*, vol. 216, Feb. 1969, p. 297-300.

Research supported by the Wisconsin Heart Association.

Examination of the postulate that adenosine is the vasoactive mediator in the regulation of coronary blood flow. Hypoxia and tachycardia are known to increase coronary blood flow. Lidoflazine, a newly developed coronary vasodilator, was found to enhance markedly the coronary vasodilator action of adenosine injected intravenously. An attempt was made to determine whether potentiation of coronary vasodilator responses to hypoxia or heart rate increases occurs after administration of lidoflazine. In four dogs coronary vasodilator responses to hypoxia or to electrically induced



heart rate changes were obtained before and after lidoflazine, and it was found that lidoflazine did not significantly alter the responses. The results of the study do not provide support for the hypothesis that adenosine is the mediator in the coronary blood flow regulation. On the other hand, they do not invalidate the adenosine hypothesis, since the mechanism of enhancement of adenosine action by lidoflazine is not fully understood.

F.R.L.

#### A70-11703

##### EFFECT OF THYROTROPIN ON THYROIDAL IODINE METABOLISM DURING HYPOXIA.

Martin I. Surks (Montefiore Hospital and Medical Center, Div. of Medicine, Endocrine Research Laboratory; Yeshiva University, Albert Einstein College of Medicine, Dept. of Medicine, New York, N.Y.).

*American Journal of Physiology*, vol. 216, Feb. 1969, p. 436-439. 13 refs.

Contract No. DA-49-193-MD-2967.

To assess the role of thyrotropin (TSH) in the altered thyroidal iodine metabolism observed during hypoxia, thyroidal 24-hr radioiodine uptake, thyroid-to-serum iodide concentration ratio (T/S ratio), and plasma protein-bound iodine-131 (PBI-131) were measured in control and hypoxic intact and hypophysectomized rats. These measures were reduced during hypoxia in intact rats but no decrease from control levels was observed when hypoxic hypophysectomized rats were studied. The response of hypophysectomized rats to injected TSH during hypoxia was similar to control animals. Moreover, when TSH was administered to intact hypoxic animals, the 24-hr radioiodine uptake and PBI-131 returned to control values. Thus, the data appear to show that the altered thyroidal iodine metabolism during hypoxia results primarily from diminished stimulation of the thyroid by TSH.

(Author)

#### A70-11704

##### DYNAMIC RESPONSE OF THORAX AND ABDOMEN OF RABBITS IN PARTIAL AND WHOLE-BODY BLAST EXPOSURE.

Carl-Johan Clemedson, Lars Frankenberg, Arne Jönsson, Hjalmar Pettersson, and Anna-Britt Sundqvist (Research Institute of National Defence, Biophysics Div., Dept. 1, Sundbyberg, Sweden).

*American Journal of Physiology*, vol. 216, Mar. 1969, p. 615-620. 10 refs.

Measurement of the displacements of the chest, abdominal walls, and diaphragm of anesthetized rabbits exposed to air shock waves produced by 8-kg and 32-kg spherical charges of hexotol (60 per cent cyclotrimethylenetrinitramine and 40 per cent TNT). Three types of exposure were used—whole-body, chest, and abdominal exposure, respectively. The part of the body exposed to the blast wave shows a considerable instantaneous inward displacement. The unexposed part in partial body exposure shows an initial outward motion. In whole-body exposure, the diaphragm moves toward the chest cavity. In partial body exposure it moves toward the part of the body which is not exposed to the shock wave. The velocity imparted to the diaphragm is only about 1/10th of that to the chest and abdominal walls. Exposure of the thorax only causes a significant increase of elastic deformation of the chest and also a significant increment of mortality, but does not cause an increase in the degree of lung hemorrhages as compared to whole-body exposure. No visible damage to the thoracic organs was produced in the cases of abdominal exposure.

(Author)

#### A70-11705 \*

##### WATER INTAKE AND URINE OUTPUT OF RATS DURING CHRONIC CENTRIFUGATION.

Howard H. Bengel (Iowa, University, College of Medicine, Dept. of Physiology and Biophysics, Iowa City, Iowa).

*American Journal of Physiology*, vol. 216, Mar. 1969, p. 659-665. 23 refs.

NIH Grant No. GM-10093; Grant No. NGR-16-001-031.

Fifty unrestrained male rats, weighing 250-300 g at the onset of the experiment, were centrifuged 23.75 hr/day at resultant inertial fields of 3.0 and 1.7 G. Fifty control animals were not centrifuged but were placed in cages along the periphery of the centrifuge enclosure to provide otherwise similar environmental conditions. Of these, 34 were pair-fed control rats. During centrifugation, urine volumes peaked in 4-6 days at 300-400 per cent of base-line levels and then dropped back toward control values. This return was complete within 7 days at 1.7 G but still incomplete after 17 days at 3.0 G, suggesting that a faster adjustment occurs at the more moderate centrifugal field. Water intake by drinking decreased during the initial 24-hr period of exposure, but subsequent increases tended to make up for the previous dehydration. It is concluded that these alterations in function are responses, in part, to the gravity-simulating properties of centrifugation.

(Author)

#### A70-11706

##### SIMULATED RESPONSES OF DEPRESSED AND HYPERPOLARIZED MEDULLATED NERVE FIBERS.

Gordon M. Schoepfle, Gerald C. Johns, and Charles E. Molnar (Washington University, St. Louis, Mo.).

*American Journal of Physiology*, vol. 216, Apr. 1969, p. 932-938. 12 refs.

PHS Grant No. 5 R01-NB00173-17; NIH Grant No. FB-00218; ARPA Grant No. SD-302.

Description of solutions of the Frankenhaeuser-Huxley equations by a method of finite differences using a LINC computer. Simulated action potentials of *Xenopus* single-medullated nerve fibers were obtained under conditions imposed by variations in the sodium and potassium conductance factors. A shift in the sodium conductance factor vs voltage curve along the voltage axis provided a system from which there can be obtained not only a considerably depressed spike but full maximal reversal of depression by hyperpolarization. Similar results apply to a situation involving a shift in the potassium conductance factor vs voltage curve, except that marked after-potentials are involved.

M.M.

#### A70-11707

##### AMINO ACID BALANCE AND FOOD INTAKE—EFFECT OF PREVIOUS DIET ON PLASMA AMINO ACIDS.

Y. Peng, N. J. Benevenga, and A. E. Harper (Wisconsin, University, Dept. of Biochemistry, Madison, Wis.).

*American Journal of Physiology*, vol. 216, May 1969, p. 1020-1025. 33 refs.

PHS Grant No. AM-10747.

Study of the effects of previous diet and method of feeding on food intake and plasma amino acid concentrations of rats fed a low-protein diet, to which a mixture of amino acids devoid of histidine was added to create an amino acid imbalance. It is suggested that food intake regulating mechanisms are responsive to changes in amino acid intake and pattern and that food intake regulation is an important homeostatic mechanism for the control of circulating amino acid concentrations.

Z.W.

#### A70-11708

##### MUSCLE FORCE AND ELECTROMYOGRAM WITH ALTERATION IN FLOW AND COMPOSITION OF BLOOD.

D. L. Wright and R. R. Sonnenschein (California, University, School of Medicine, Dept. of Physiology, Los Angeles, Calif.).

*American Journal of Physiology*, vol. 216, May 1969, p. 1075-1080. 13 refs.

PHS Grant No. HE-05157.

Study of the behavior of the muscle force and electromyogram with alteration in the flow and composition of blood in anesthetized cats. Decreases in the developed tension and amplitude of the surface electromyogram, produced by reduction of blood flow, hemodilution, hypoxemia, or intra-arterial infusion of d-tubocurarine of

acetylcholine, are observed in the intermittently and maximally stimulated gastrocnemius soleus of the cat. Z.W.

## A70-11709

## RELATION BETWEEN MECHANICS OF CONTRACTION AND RELAXATION IN MAMMALIAN CARDIAC MUSCLE.

William W. Parmley (Peter Bent Brigham Hospital, Cardiovascular Unit, Boston, Mass.) and Edmund H. Sonnenblick (Harvard University, Harvard Medical School, Boston, Mass.).

*American Journal of Physiology*, vol. 216, May 1969, p. 1084-1091. 18 refs.

Research supported by the American Heart Association; PHS Grant No. HE-11316-02.

Study of the mechanics of cardiac relaxation utilizing an isolated preparation of the cat papillary muscle. It is demonstrated that relaxation of cardiac muscle can be markedly altered by different inotropic influences and that these alterations vary between different agents which have similar effects on active force development. Z.W.

## A70-11710

## GLUTAMINE SYNTHETASE AND RENAL AMMONIA METABOLISM.

Ralph H. Janicki (Harvard University, Harvard Medical School, Dept. of Physiology, Boston, Mass.) and Leon Goldstein (Brown University, Div. of Biomedical Sciences, Providence, R.I.).

*American Journal of Physiology*, vol. 216, May 1969, p. 1107-1110. 15 refs.

PHS Grant No. AM-12443.

Study of the distribution of renal and hepatic glutamine synthetase in six representative mammals whose average urine pH values ranged from 8.1 to 5.8. An inverse relation is found between renal glutamine synthetase activity and urinary acidity (and ammonia excretion). In contrast, there is a direct relation between renal glutaminase activity and, to some extent, hepatic glutamine synthetase activity and urinary activity of these mammals. Z.W.

## A70-11711

## AMINO ACID TRANSPORT DURING WORK-INDUCED GROWTH OF SKELETAL MUSCLE.

A. L. Goldberg and H. M. Goodman (Harvard University, Harvard Medical School, Dept. of Physiology, Boston, Mass.).

*American Journal of Physiology*, vol. 216, May 1969, p. 1111-1115. 19 refs.

Research supported by Harvard University.

Study of the accumulation of alpha-aminoisobutyric acid by the soleus and plantaris muscles of the rat *in vivo* during work-induced growth. The results obtained suggest that amino acid transport in skeletal muscle varies with the level of muscular work. It is observed that increased work leads to an increased transport of amino acid. Z.W.

## A70-11712

## EFFECTS OF DISUSE AND DENERVATION ON AMINO ACID TRANSPORT BY SKELETAL MUSCLE.

A. L. Goldberg and H. M. Goodman (Harvard University, Harvard Medical School, Dept. of Physiology, Boston, Mass.).

*American Journal of Physiology*, vol. 216, May 1969, p. 1116-1119. 18 refs.

Research supported by Harvard University.

Study of the effects of decreased muscular work and denervation on the alpha-aminoisobutyric acid uptake by the soleus and plantaris muscles in rats. It is concluded that the amino acid uptake by muscle is influenced by the amount of muscular activity. Z.W.

## A70-11713

EFFECTS OF PCO<sub>2</sub> ON SPINAL CORD BLOOD FLOW.

John W. Pender (Pennsylvania, University, School of Medicine, Dept. of Anesthesiology, Philadelphia, Pa.), S. Craighead Alexander (Palo Alto Clinic, Palo Alto, Calif.), and Allan L. Smith.

*American Journal of Physiology*, vol. 216, May 1969, p. 1158-1163. 15 refs.

NIH-supported research; PHS Grants No. GM-09070-06; No. GM-15430-01.

Study of the spinal cord blood flow and its response to the carbon dioxide partial pressure in ten goats anesthetized with a mixture of nitrous oxide and oxygen. The results obtained indicate that the carbon dioxide sensitivity of some cord tissue is much like that of the brain, whereas other cord tissue is much less responsive. Z.W.

## A70-11714

## INFLUENCE OF AMBIENT TEMPERATURE ON EXCRETION OF CATECHOLAMINES AND METABOLITES.

A. Shum, G. E. Johnson, and K. V. Flattery (Toronto, University, Dept. of Pharmacology, Toronto, Canada).

*American Journal of Physiology*, vol. 216, May 1969, p. 1164-1169. 16 refs.

Defence Research Board of Canada Grant No. 9310-110.

Study of the influence of the ambient temperature on the excretion of epinephrine, norepinephrine, and their major metabolites in rats. It is concluded that norepinephrine secretion increases in a cold environment and decreases during moderate warm exposures. Heat stress at 36 deg C, however, increases norepinephrine excretion. Thus it is demonstrated that the rate of norepinephrine synthesis is dependent, at least partially, on the ambient temperature and can dissociate itself from the rate of norepinephrine secretion. Z.W.

## A70-11715

## MUSCLE HEAT PRODUCTION AND WORK—EFFECT OF VARYING ISOTONIC LOAD.

John T. Fales (Johns Hopkins University, Dept. of Environmental Medicine, Baltimore, Md.).

*American Journal of Physiology*, vol. 216, May 1969, p. 1184-1187. 6 refs.

PHS Grant No. AM-05524.

Measurement of the total heat production of frog sartorius muscle under isotonic and isometric conditions, using a gradient-layer calorimetry. It is shown that the total energy released in an isotonic contraction, as assessed by total heat production, is equal to the energy released in an isometric contraction plus an amount of energy proportional to the external work done. These results are in agreement with data obtained using the classical thermopile. Z.W.

## A70-11716

## EFFECTS OF CONSTANT-INFLOW AND CONSTANT-PRESSURE PERFUSION ON VASCULAR RESPONSES.

D. L. Davis and Mary C. Hammond (Georgia, Medical College, Dept. of Physiology, Augusta, Ga.).

*American Journal of Physiology*, vol. 216, June 1969, p. 1292-1299. 12 refs.

Research supported by the Georgia Heart Association; NIH Grant No. HE-00240.

Comparison of resistance changes of series-coupled segments of the hindpaw vascular segments, of the total hindpaw vasculature, and of the total forelimb vasculature of the dog under constant-inflow and constant-pressure perfusion. Despite large variation in individual responses, separate series-coupled vascular segments and both total vascular beds showed larger resistance changes under constant-pressure perfusion than under conditions of constant inflow. Resistance changes were not related to initial resistances, but probably were modified by differences in intraluminal pressures obtaining during responses under the two perfusion techniques. M.M.

## A70-11717

**METABOLIC RESPONSE OF RAT BRAIN TO ACUTE HYPOXIA—INFLUENCE OF POLYCYTHEMIA AND HYPERCAPNIA.**

Z. Gottesfeld and A. T. Miller, Jr. (North Carolina, University, School of Medicine, Dept. of Physiology, Chapel Hill, N.C.). *American Journal of Physiology*, vol. 216, June 1969, p. 1374-1379. 28 refs.

Contracts No. DA-49-193-MD-2371; No. AF 41 (609)-3125.

Evaluation of the influence of polycythemia and hypercapnia on the apparent oxygenation of rat brain during acute hypoxia, using changes in creatine phosphate concentration and lactate/pyruvate ratio of the brain. Polycythemia alone had no beneficial effect. Hypercapnia alone improved brain oxygenation in both normo-cythemic and polycythemic animals. Maximal improvement was seen with the combination of polycythemia and hypercapnia. M.M.

## A70-11718

**ADRENERGIC RESPONSES OF THE HEPATIC CIRCULATION.**

Gordon Ross and Madeline Kurrasch (California, University, School of Medicine, Dept. of Physiology, Los Angeles, Calif.).

*American Journal of Physiology*, vol. 216, June 1969, p. 1380-1385. 12 refs.

PHS Grant No. HE-10626-02.

Determination of blood flow changes in the portal vein and hepatic artery of anesthetized cats following intraportal and intrahepatic arterial administration of isoproterenol, epinephrine, and norepinephrine, using noncannulating electromagnetic flowmeters. Both intrahepatic arterial and intraportal isoproterenol dilated the hepatic arterial vascular bed, whereas epinephrine and norepinephrine produced vasoconstriction. The observations indicate that beta adrenergic receptors are present in the hepatic arterial bed, and that the changes in portal vein flow induced by catecholamines depend more on changes in the flow of blood through the intestine and spleen than on vascular changes within the liver. M.M.

## A70-11719

**SPECIES VARIABILITY IN HEMODYNAMIC RESPONSE TO PAIRED-PULSE STIMULATION.**

Theofilos J. Tsagaris, Richard B. Sutton, and Hiroshi Kuida (Utah, University, College of Medicine, Dept. of Internal Medicine; Veterans Administration Hospital, Salt Lake City, Utah).

*American Journal of Physiology*, vol. 216, June 1969, p. 1409-1417. 14 refs.

Research supported by the Utah Heart Association; PHS Grants No. HE-07618; No. HE-5150.

Comparison of left ventricular function during paired-pulse (PPS) and single-pulse (SPS) stimulation in dogs, sheep, goats, and calves before and after heart failure induced by propranolol. Similar studies were performed in monkeys, comparing PPS with sinus rhythm. Augmentation of myocardial performance was observed during PPS in the dog after propranolol, but was not consistently observed before propranolol. The inotropic response to PPS in the monkey was negative before propranolol, but positive after propranolol. The only consistent effect of PPS in the sheep, goats, and calves was an increase in the rate of rise of the left ventricular pressure during isovolumic contraction. M.M.

## A70-11720 \*

**FAT METABOLISM AND CHRONIC ACCELERATION.**

J. W. Evans, A. H. Smith, and J. M. Boda (California, University, Dept. of Animal Science and Dept. of Animal Physiology, Davis, Calif.).

*American Journal of Physiology*, vol. 216, June 1969, p. 1468-1471. 26 refs.

Grant No. NGR-05-004-008.

Determination of body mass and percentage body fat in chickens exposed to 1.75, 2.5, or 3 G for 24 weeks. Plasma-free fatty acid (FFA) metabolism, liver citrate cleavage, and malic enzyme

activities of asymptomatic, acceleration-sick, and recovered birds exposed to chronic acceleration (3 G) were compared with non-centrifuged control birds. The FFA half-lives were the same for all groups, but plasma FFA concentrations, pool sizes, flux, and utilization rates decreased for the asymptomatic and acceleration-sick groups compared with control and recovered birds. Body fat percentages were decreased for all centrifuged birds. M.M.

## A70-11721 #

**OXYGEN UPTAKE STIMULATION FOLLOWING Na-L-LACTATE INFUSION IN ANESTHETIZED DOGS.**

Monroe S. Karetzky and Stephen M. Cain (USAF, School of Aerospace Medicine, Respiratory Physiology Branch, Brooks AFB, Tex.).

*American Journal of Physiology*, vol. 216, June 1969, p. 1486-1490. 16 refs.

Experimental investigation in which the naturally occurring isomer of sodium lactate was infused into anesthetized dogs in two sets of experiments. As a comparison for the effects of alkalization alone, a similar procedure was carried out in a third set of experiments using sodium bicarbonate. The principal observation was that of increased mean oxygen uptake. After beta block, the increased mean oxygen uptake with lactate was in proportion to the amount of lactate infused and less than one-half that prior to beta block. The oxygen cost of exogenous lactate loads clearly represents a resultant of several calorogenic processes. M.M.

## A70-11722

**FRUCTOSE METABOLISM IN SEA-LEVEL AND HIGH-ALTITUDE NATIVES.**

Baltazar Reynafarje, Luz Oyola, Richardo Cheesman, Emilio Marticorena, and Sergio Jimenez (Lima, Universidad Nacional Mayor de San Marcos, Instituto de Biología Andina, Lima, Peru).

*American Journal of Physiology*, vol. 216, June 1969, p. 1542-1547. 14 refs.

NIH Grant No. GM-10219.

Investigation of fructose metabolism in liver and extrahepatic tissues of subjects from sea level and high altitude. Fructose was injected into the hepatic vein through a catheter. Glucose, pyruvate, lactate, and fructose concentration were simultaneously determined in arterial and venous blood. It was found that initially high-altitude subjects metabolize fructose more rapidly than sea-level residents. In the latter this metabolism is performed mainly by the liver, following Hers' pathway. In highlanders fructose is metabolized mainly by extrahepatic tissues following Embden-Meyerhof's pathway. Fructose disappearance gives rise to an immediate accumulation of lactate and pyruvate in the blood, which is from 2 to 3 times greater in sea-level than in high-altitude individuals. M.M.

## A70-11723

**COMBINED EFFECTS OF AORTIC AND RIGHT ATRIAL PRESSURES ON AORTIC FLOW.**

Caleb W. Hendon and Kiichi Sagawa (Mississippi, University, School of Medicine, Dept. of Physiology and Biophysics, Jackson, Miss.).

*American Journal of Physiology*, vol. 217, July 1969, p. 65-72. 29 refs.

PHS Grant No. HE-10581.

Determination of aortic flow (AF equals cardiac output minus coronary flow) as a function of both mean aortic pressure (MAP) and mean right atrial pressure (MRAP) simultaneously. In ten dogs MAP was altered from 30 to 300 mm Hg while keeping MRAP at fixed levels. In another 11 dogs MRAP was increased from 0 to 20 mm Hg, while keeping MAP at specified levels. When MRAP was within the physiological range, the heart-lung compartment could pump an almost constant AF until MAP rose above 180 mm Hg. Such a comprehensive analysis of the full range of flow responses of the pump to MAP and MRAP provides necessary data for use in systems analyses of the circulation. F.R.L.

**A70-11724 #**  
**DIMINUTION OF LACTATE RISE DURING HYPOXIA BY  $P_{CO_2}$  AND  $\beta$ -ADRENERGIC BLOCKADE.**

Stephen M. Cain (USAF, School of Aerospace Medicine, Respiratory Physiology Branch, Brooks AFB, Tex.).

*American Journal of Physiology*, vol. 217, July 1969, p. 110-116. 12 refs.

Results of ventilation of 30 anesthetized, paralyzed dogs with gas mixtures to make them hypoxic before and after beta-adrenergic blockade (beta-block) with propranolol. During the 30-min hypoxic periods, 15 dogs were made hypocapnic (carbon dioxide partial pressure of about 20 torr) and the rest were hypercapnic (carbon dioxide partial pressure of about 75 torr). Slopes of the lines showing the increase in lactate (delta-lactate) and excess lactate (XL) in relation to the accumulated net oxygen deficit were alike for all four experimental conditions. Both beta-block and hypercapnia acted to shift the lines for delta-L and XL to the right on the net oxygen deficit axis, but the combination of hypercapnia and beta-block produced the greatest increase in net oxygen deficit intercept before delta-L and XL appeared. The similar actions of hypercapnia and beta-block on these relationships were attributed to inhibition of catecholamine calorogenesis. Calorogenic factors accounted for 70 per cent of the difference in delta-L between hypocapnic hypoxia without beta-block and hypercapnic hypoxia with beta-block. The remainder was attributed to direct effects of pH on glycolytic rates. Excess lactate was apparently independent of these direct pH effects.

F.R.L.

**A70-11725**  
**ACCUMULATION OF MATERIAL AT SEVERED ENDS OF MYELINATED NERVE FIBERS.**

Gary Johnson, Richard S. Smith, and Gerald S. H. Lock (Alberta, University, Surgical-Medical Research Institute and Dept. of Mechanical Engineering, Edmonton, Alberta, Canada).

*American Journal of Physiology*, vol. 217, July 1969, p. 188-191. 10 refs.

Research supported by the Medical Research Council of Canada.

Examination of the time course of end-bulb formation, in vitro, in myelinated nerve fibers from *Xenopus laevis* and rats of Wistar origin. The time course may be fitted by exponentially rising curves. It can be shown that this observation is consistent with the idea that the nerve fiber is an elastic capillary constricting passively. If the movement of axoplasm is the result of passive constriction, then under these conditions the associated movements of myelin are likely to follow from, rather than be causal to, the change of state of the axis cylinder.

F.R.L.

**A70-11726**  
**MYOCARDIAL OXYGEN CONSUMPTION ASSOCIATED WITH EXTERNAL WORK—THE FENN EFFECT.**

Henry Neal Coleman, Edmund H. Sonnenblick, and Eugene Braunwald (U.S. Public Health Service, National Institutes of Health, National Heart Institute, Bethesda, Md.).

*American Journal of Physiology*, vol. 217, July 1969, p. 291-296. 28 refs.

Use of the polarographic method for determination of oxygen consumption of cat papillary muscle to investigate both afterloaded and isometric contractions in 13 experiments, and isometric contractions in six experiments. Values for the oxygen consumption were determined for increasing afterloads at a constant initial muscle length. Subsequently, initial muscle length was decreased in order to allow determination of the oxygen consumption for isometric contractions in which tension development was equal to that attained during afterloaded isotonic contractions. At comparable tensions, afterloaded contractions, in which shortening and external work occurred, were associated with an additional oxygen consumption. This additional oxygen consumption was directly proportional to the external work of afterloaded contractions and thus is analogous to the Fenn effect in the energetics of skeletal muscle.

Similarly, the oxygen consumption of isometric contractions was directly proportional to the "internal" contractile element work (CEW) performed during tension development. Total CEW of afterloaded contractions was not a simple linear correlate of the oxygen consumption.

F.R.L.

**A70-11727**  
**EFFECTS OF METABOLISM AND DISTRIBUTION OF CARBON MONOXIDE ON BLOOD AND BODY STORES.**

Kimmo Luomanmäki and Ronald F. Coburn (Pennsylvania, University, School of Medicine, Philadelphia, Pa.).

*American Journal of Physiology*, vol. 217, Aug. 1969, p. 354-363. 37 refs.

NIH Grant No. RO1 HE 10331.

Discussion of an experimental investigation in which human subjects and anesthetized dogs were breathing carbon monoxide in a closed system. Evidence is presented that the distribution of carbon monoxide between blood and other tissues remains constant with changes in arterial oxygen tension from 40 to 650 mm Hg, arterial carbon dioxide tension from 28 to 65 mm Hg, and carboxyhemoglobin from 0.8 to 55 per cent saturation. With more severe arterial hypoxemia, up to 50 per cent of the blood carbon monoxide shifted into extravascular tissue.

V.P.

**A70-11728**  
**ACTIVATION OF CONTRACTILE SYSTEM IN DEPOLARIZED SKELETAL MUSCLE FIBERS.**

R. L. Parsons and W. L. Nastuk (Columbia University, College of Physicians and Surgeons, Dept. of Physiology, New York, N.Y.).

*American Journal of Physiology*, vol. 217, Aug. 1969, p. 364-369. 18 refs.

NIH Grant No. NB-04988.

Discussion of experiments in which local contractures in potassium-depolarized amphibian skeletal muscle fibers were produced either by intracellular injection of cations iontophoretically, or by microperfusion of carbamylcholine directly onto the post-junctional membrane of the individual fibers. Evidence is presented in support of the hypothesis that the termination of a potassium ion-induced contracture is caused by the reduction of the intracellular calcium-ion concentration.

V.P.

**A70-11729 \***  
**POSSIBLE ROLE OF AMYGDALA IN REGULATION OF GASTRIC SECRETION IN CHRONIC FISTULA RATS.**

Y. H. Lee, J. H. Thompson, and James J. McNew (California, University, School of Medicine, Brain Research Institute, Los Angeles, Calif.).

*American Journal of Physiology*, vol. 217, Aug. 1969, p. 505-510. 28 refs.

Research supported by the American Medical Association Education and Research Foundation; NSF Grant No. GB-6105; Grant No. NSG-502.

Discussion of experiments in which stainless-steel micropipettes were implanted bilaterally into the corticomedial or basolateral amygdala of Sprague-Dawley rats fitted with a Brodie-type chronic gastric cannula. These amygdaloid areas were previously shown to influence some autonomic functions. The results obtained indicate that the amygdala does play a significant role in the regulation of gastric secretion. They also indirectly support the view that acetylcholine is a possible neurotransmitter while serotonin is an inhibitory transmitter in the amygdaloid area.

V.P.

**A70-11730 \***  
**EFFECT OF AMBIENT pH ON SODIUM TRANSPORT ACROSS ISOLATED TURTLE BLADDERS.**

Dominick E. Gentile (Louisville, University, School of Medicine, Dept. of Medicine and Dept. of Pediatrics, Louisville, Ky.) and

William A. Brodsky (New York, City University, Institute for Medical Research and Studies and Mount Sinai School of Medicine, New York, N.Y.).

*American Journal of Physiology*, vol. 217, Sept. 1969, p. 652-660. 20 refs.

NIH Grant No. A-461; NSF Grant No. GB-5183; Grant No. NGR-18-002-015.

Determination of the effect of increasing the activity of H ion in the mucosal fluid on the transport of sodium across the short-circuited turtle bladder. Isolated bladders of *Pseudemys* turtles were bathed in an asymmetrical system (sodium methyl-sulfate on the mucosa and Na-Ringer solution on the serosa). Decreasing mucosal pH induced decreases in short-circuiting current, potential difference (PD), forward flux, and net flux of sodium, and increases in backflux of sodium and resistance. When in a symmetrical system (sodium methyl sulfate and Ringer solution on both mucosa and serosa) similar decreases in mucosal pH induced qualitatively similar changes, except that the short-circuiting current and PD reached lower minimal levels. G.R.

#### A70-11731

##### EFFECT OF STARVATION ON INTESTINAL AMINO ACID ABSORPTION.

Manfred Steiner and Seymour J. Gray (Massachusetts Institute of Technology, Dept. of Nutrition and Food Science, Cambridge, Mass.).

*American Journal of Physiology*, vol. 217, Sept. 1969, p. 747-752. 26 refs.

NIH Grants No. AM-08301-02; No. AM-08997-01; Contract No. AF 33(615)-2924.

Study of the effect of starvation on the absorption of L-valine by small intestine using an in vivo technique in four-day starved rats. The absorption medium contained either L-valine as the only amino acid, an equimolar mixture of the ten essential amino acids, or a casein hydrolysate. Absorption per unit weight of small intestinal mucosa showed no significant difference between starved and nonstarved animals when the absorption medium contained casein hydrolysate. When the intestinal lumen, however, contained a 10-mM L-valine solution or a mixture of essential amino acids, starved rats exhibited much greater rates and total magnitudes of L-valine transport. De novo synthesis of protein in mucosal tissue was greatly reduced in starved as compared to normal nonstarved animals, both absorbing casein hydrolysate. G.R.

#### A70-11732

##### PRIMATE KIDNEY FUNCTION IN HEMORRHAGIC SHOCK.

Ewald E. Selkurt (Indiana University, Medical Center, Dept. of Physiology, Indianapolis, Ind.).

*American Journal of Physiology*, vol. 217, Oct. 1969, p. 955-961. 24 refs.

PHS Grant No. HE-09553.

Use of standardized hemorrhagic shock procedure to study alterations in renal hemodynamics and clearances in the owl monkey. The parameters examined included transport of organic substances (creatinine, PAH) and electrolytes, with related alterations in urinary concentrating mechanism. The most significant change which resulted was a loss in urinary concentrating ability, and free water clearance changed from negative to positive. It is concluded that the loss of concentrating ability was largely the result of reduced filtration rate and reduced delivery of sodium to the ascending limb of the loop of Henle, coupled with persistent medullary blood flow, which eventuated in washout of the gradient. F.R.L.

#### A70-11733

##### INFLUENCE OF BLOOD PH ON ADRENOMEDULLARY RESPONSE TO HEMORRHAGE.

V. Fiorica, P. F. Iampietro, M. J. Burr, and R. Moses (Federal Aviation Administration, Civil Aeromedical Institute, Physiology Laboratory, Oklahoma City, Okla.).

*American Journal of Physiology*, vol. 217, Oct. 1969, p. 1211-1215. 26 refs.

Consideration of how the usual sympathoadrenal response to hemorrhage is affected by concurrent alkalemia. Experiments were performed with anesthetized dogs whose blood pH was elevated by mechanical hyperventilation. Adrenomedullary stimulation was provided by rapid hemorrhage to 50 mm Hg. The results suggest that the initial release of catecholamines from the adrenal medulla is not impeded during alkalemia, but that a high blood pH may prevent the sustained release of catecholamines normally observed during hemorrhagic hypotension. F.R.L.

#### A70-11991

##### NUTRITIONAL CIRCULATION IN THE HEART. I—EFFECT OF CHANGE IN HEART RATE ON MYOCARDIAL OXYGEN CONSUMPTION AND NUTRITIONAL CIRCULATION WITH CONSTANT TOTAL CORONARY BLOOD FLOW.

P. Somani, H. F. Hardman (Marquette University, School of Medicine, Dept. of Pharmacology, Milwaukee, Wis.), and A. R. Laddu.

*Life Sciences, Part I—Physiology and Pharmacology*, vol. 8, Nov. 1, 1969, p. 1151-1162. 22 refs.

PHS Grant No. HE-08331.

Study of the effect of a change in heart rate upon the nutritional circulation in the isolated supported heart preparation in situ in which the total coronary blood flow was kept constant. The results seem to indicate that under constant flow conditions, the observed increase in the rate of myocardial oxygen consumption following increased heart rate is primarily due to a more complete extraction of oxygen from a fewer number of open capillaries. The data suggest the existence of a mechanism for modulation of oxygen extraction independent of the capillary exchange surface and capillary blood flow. G.R.

#### A70-11992 \*

##### HYPERBARIC OXYGENATION AND BRAIN NOREPINEPHRINE AND 5-HYDROXYTRYPTAMINE—OXYGEN-PRESSURE INTERACTIONS.

Morris D. Faiman, Raymond G. Mehl (Kansas University, School of Pharmacy, Dept. of Pharmacology and Toxicology, Lawrence, Kan.), and Arun Heble (Lannett Laboratories, Philadelphia, Pa.).

*Life Sciences, Part I—Physiology and Pharmacology*, vol. 8, Nov. 1, 1969, p. 1163-1178. 25 refs.

PHS Grant No. MH-13550; Grant No. NSG-298.

Description of studies carried out to differentiate between the effects of pressure and oxygen tension on the hyperbaric oxygenation (OHP) induced depletion of brain norepinephrine (NE) and 5-hydroxytryptamine (5-HT) in mice. The results of these studies appear to indicate that between an oxygen tension of 2280 and 3800 mm Hg, the depletion of brain NE and 5-HT occurring in the mice investigated under OHP is a function of the oxygen pressure and is independent of the total environmental pressure within the chamber. In addition, only the oxygen pressure was found to be responsible for the convulsions occurring under OHP. G.R.

#### A70-12054

##### TEMPERATURE COMPENSATED STRAIN GAGE FOR BIOMEDICAL INSTRUMENTATION.

J. S. Jackson and R. E. Puckett (Kentucky University, College of Engineering, Lexington, Ky.).

IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS AND ELECTRONIC INDUSTRIES ASSOCIATION, ELECTRONIC COMPONENTS CONFERENCE, WASHINGTON, D.C., APRIL 30-MAY 2, 1969, PROCEEDINGS. (A70-12052 02-09)

New York, Institute of Electrical and Electronics Engineers, Inc., 1969, p. 8-14.

Description of an approach to the determination of intraoral pressure, specifically measurement of the pressure between the tongue and teeth. A silicon strain gauge transducer was developed to facilitate the instrumentation, and two types of temperature-compensated strain gauges were also developed (a cantilever and a capsule). Where space limitations are severe, the cantilever gauge offers superior sensitivity. The active elements comprise a single silicon chip and compensating thermistor. Elimination of respiratory artifacts requires dynamic as well as static temperature compensation. Thermal lag of the strain gauge is greater than that of the thermistor. This permits use of a lag compensating network in conjunction with the thermistor to achieve dynamic compensation. Frequency response of the strain gauge is unaffected by the compensating network. One operational amplifier performs three essential operations—namely, summation of strain gauge and thermistor outputs, amplification of the resultant signal, and synthesis of the lag response for dynamic compensation. F.R.L.

## A70-12088

## A COMPARISON BETWEEN FREQUENCY POTENTIATION AND POSTEXTRASYSTOLIC POTENTIATION IN VITRO AND IN SITU.

U. Kilz, W. Niedermayer, K. J. Nordmann, J. Schaefer, H. J. Schwarzkopf, and P. A. van Zwieten (Kiel, Neue Universität, Kiel, West Germany).

*Pflügers Archiv*, vol. 311, no. 3, 1969, p. 226-242. 16 refs.

Comparative investigation of the force-frequency relationship and postextrasystolic potentiation in isolated auricles of the guinea-pig and in the dog heart in situ. It is found that in vitro and in situ, the occurrence of extrasystoles does not only potentiate the contraction following the extrasystole but also the subsequent beats. In contrast to the studies in vitro, frequency potentiation could not be demonstrated satisfactorily in the dog heart in situ, probably as a result of the compensatory influence of the circulation. On the other hand, during transition from a higher to a lower frequency in situ, a clear cut potentiation was observed in the poststimulation phase. This potentiation could still be demonstrated when ventricular filling pressure and end diastolic pressure in the aorta did not change any more. As in the isolated muscle preparation, a larger difference between the frequencies of stimulation provoked a larger degree of increased contractility. The possibility of using frequency and postextrasystolic potentiation for the diagnostic evaluation of myocardial insufficiency in situ is discussed. Z.W.

## A70-12089

THE BEHAVIOR OF THE ENDTIDAL RESPIRATION GAS PRESSURES, THE OXYGEN UPTAKE, AND THE CARBON DIOXIDE OUTPUT AFTER SIMPLE APNEA IN WATER, ON LAND, AND DURING APNEIC DIVING (DAS VERHALTEN DER ENDEXPIRATORISCHEN ATEMGASDRUCKE, DER O<sub>2</sub>-AUFNAHME UND CO<sub>2</sub>-ABGABE NACH EINFACHER APNOE IM WASSER, AN LAND UND APNOEISCHEM TAUCHEN).

Ulrich Tibes and Jürgen Stegemann (Deutsche Sporthochschule, Physiologisches Institut, Cologne, West Germany).

*Pflügers Archiv*, vol. 311, no. 4, 1969, p. 300-311. 31 refs. In German.

Discussion of investigations which were performed in order to find out whether breath-hold or apneic diving will alter oxygen consumption and carbon dioxide production in man. In the tests six male subjects stopped breathing for periods of 30, 60, 90, 120, and 165 sec while immersed in water and while out of water. The endtidal partial pressures of oxygen and carbon dioxide, the oxygen uptake, and carbon dioxide output of each tidal were determined by means of an integrating pneumotachograph and a mass spectrometer in the recovery period. The oxygen consumption was reduced up to

38 per cent during breath holding in air, up to 29 per cent during breath holding immersed in water, and up to 28 per cent during diving. The endtidal oxygen partial pressure of the first expiration after apnea decreased as a function of the apneic time. The endtidal partial pressure of carbon dioxide and the carbon dioxide output of the first expiration were found to be independent of apneic time.

G.R.

## A70-12090

## OXYGEN CONSUMPTION AND MECHANICAL PERFORMANCE OF DOG GASTROCNEMIUS MUSCLE WITH ARTIFICIALLY INCREASED BLOOD FLOW.

J. Piiper (Max-Planck-Institut für experimentelle Medizin, Abteilung Physiologie, Göttingen, West Germany), P. E. di Prampero, and P. Cerretelli (Milan, University, Dept. of Physiology, Milan, Italy).

*Pflügers Archiv*, vol. 311, no. 4, 1969, p. 312-325. 8 refs.

Oxygen consumption, lactic acid production and mechanical performance of the gastrocnemius muscle were measured in dogs anesthetized with morphine, chloralose, and urethane during supra-maximal stimulation to rhythmic isotonic tetanic contractions of varied force and duration. The muscle was artificially perfused with arterial blood at flow rates higher by a factor of 2 to 4 than those obtained with intact blood supply and normal arterial blood pressure. An attempt was made to subdivide the total net oxygen consumption into two components attributable to shortening (dynamic work) and to maintenance of contraction ("static work"), respectively. The oxygen consumption attributable to maintenance of contraction turned out to be nearly independent of the load (2 to 8 kg). With 8 kg load, the oxygen consumed for maintenance of a contraction during 0.40 sec; with 2 kg load, the corresponding time was 0.24 sec. Comparison with measurements performed with normal blood supply showed that for the same load and stimulation parameters the mechanical performance was about equal whereas the oxygen uptake was considerably higher in the overperfused muscle. The lactic acid formation rate was small in all cases and energetically rather insignificant. (Author)

## A70-12091

AN EXTRAPOLATION METHOD FOR THE BLOODLESS DETERMINATION OF THE OXYGEN AND CARBON DIOXIDE PARTIAL PRESSURES IN MIXED VENOUS BLOOD (EIN EXTRAPOLATIONSVERFAHREN ZUR UNBLUTIGEN BESTIMMUNG DES O<sub>2</sub>- UND CO<sub>2</sub>-PARTIALDRUCKES IM VENÖSEN MISCHBLUT).

W. Döhring and G. Thews (Mainz, Universität, Physiologisches Institut, Mainz, West Germany).

*Pflügers Archiv*, vol. 311, no. 4, 1969, p. 326-341. 25 refs. In German.

Description of a new method of bloodlessly determining the oxygen and carbon dioxide partial pressures in mixed venous blood by using a platinum electrode and an infrared carbon dioxide meter. The subject first takes a single breath of a gas mixture consisting of 10 to 13 vol per cent carbon dioxide in nitrogen. At the end of the following expiration, breathing is switched from the open-circuit respiratory system to a closed one, whose rebreathing bag is initially filled with 1.5 to 2.5 liters of a mixture containing from 5.5 to 7.5 vol per cent carbon dioxide in nitrogen. The respiratory oxygen and carbon dioxide partial pressure changes in the subject's mouthpiece are continuously analyzed. G.R.

## A70-12092

## INFLUENCE OF SPINAL CORD AND PERIPHERAL TEMPERATURE ON THE REFLEX TENSION OF "RED" AND "PALE" MUSCLES (DER EINFLUSS DER SPINALEN UND PERIPHEREN TEMPERATUR AUF DIE REFLEXSPANNUNG "ROTER" UND "BLASSER" MUSKELN).

W.-J. Stelter, G. Spaan, and F. W. Klussmann (Max-Planck-Gesellschaft zur Förderung der Wissenschaften, William G. Kerckhoff-Institut, Bad Nauheim, West Germany).

*Pflügers Archiv*, vol. 312, no. 1-2, 1969, p. 1-17. 40 refs. In German.

Study of the influence of spinal cord and skin temperature on the tension-extension diagrams in 12 lightly anesthetized cats in the M. soleus, M. tibialis ant., M. extensor digit. long., and M. gastrocnemius muscles. It is found that with a lowering of the spinal cord temperature the reflex tension of the "red" M. soleus, mainly innervated by tonis fibers, decreased rapidly, and the extension-tension curve paralleled that of the denervated muscle. In the "pale" M. tibialis ant., M. extensor digit. long., and M. gastrocnemius, which have a high proportion of phase innervation, the reflex tension increased to a maximum at extraspinal temperatures between 35 and 30 deg C. A further reduction in temperature also decreased the reflex tension in these muscles. Elevation of the spinal temperature above normal body temperature decreased reflex tension in all muscles. Peripheral cooling resulted in an increase in tension in all muscles, the peak tension of the extension-tension diagrams always being higher than during cooling of the spinal cord. It is concluded that the sensitivity of the spinal motoneurons to direct thermal stimulation, as well as to direct thermal stimulation via the thermoreceptors of the skin, depends on the size of the cell or on some factor correlated with its size. The experiments also suggest that the rhythm and the frequency of cold shivering is set by fast phasic alpha motoneurons.

Z.W.

#### A70-12093

ANNUAL ROCKY MOUNTAIN BIOENGINEERING SYMPOSIUM, 6TH, UNIVERSITY OF WYOMING, LARAMIE, WYO., MAY 5, 6, 1969, CONFERENCE RECORD.

New York, Institute of Electrical and Electronics Engineers, Inc., 1969. 94 p.  
\$7.50.

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#### A70-12094 #

DIGITAL COMPUTER TECHNIQUES FOR ESTIMATION OF SEVERITY IN VALVULAR AORTIC STENOSIS.

Herbert D. Ruttenberg (California, University, School of Medicine, Dept. of Pediatrics /Cardiology/) and Ben L. Ettelson.

IN: ANNUAL ROCKY MOUNTAIN BIOENGINEERING SYMPOSIUM, 6TH, UNIVERSITY OF WYOMING, LARAMIE, WYO., MAY 5, 6, 1969, CONFERENCE RECORD. (A70-12093 02-05)  
New York, Institute of Electrical and Electronics Engineers, Inc., 1969, p. 19-24. 9 refs.

Description of a program for estimating aortic valve area with the aid of a small digital computer. Computer routines meeting the criterion of operability by a physician, nurse, or technician without previous computer experience were developed for the LINC computer. Clinical studies were made on five patients. Because of the unavailability of a computer in the cardiac catheterization laboratory, a tape recorder was used for data acquisition with subsequent playback into the computer. The program successfully acquired the data from tape and computed results which were in agreement with manually calculated values at the 5 per cent level of significance. The studies brought to light certain minor changes needed in the computer routines to improve reliability. It was concluded that the program is feasible for clinical use with off-line and on-line computer analysis.

M.M.

#### A70-12095 #

CARDIOVASCULAR HEALTH SCREENING—TRANSDUCTION PROBLEMS AND SOLUTIONS.

A. H. Purdy, B. A. Rowley, D. W. Douglas, E. M. Simmons, Jr., J. C. Lysen, B. J. Schultz, and J. T. Holen (Missouri, University, Columbia, Mo.).

IN: ANNUAL ROCKY MOUNTAIN BIOENGINEERING SYMPOSIUM, 6TH, UNIVERSITY OF WYOMING, LARAMIE, WYO., MAY 5, 6, 1969, CONFERENCE RECORD. (A70-12093 02-05)  
New York, Institute of Electrical and Electronics Engineers, Inc., 1969, p. 28-30. 5 refs.

PHS Grant No. RM 00009.

Description of methods for rapidly transducing the physiological signals of the cardiovascular system in a nontraditional manner. A new design for ECG and impedance plethysmograph electrodes is shown, together with an unusual chest microphone application. It is shown that in a few seconds it is possible to screen a patient for a vector ECG, heart sounds, and peripheral pulse waves.

M.M.

#### A70-12096 #

VITAL FUNCTION TELEMETRY.

W. A. Chambers and R. A. Stratbucker (Nebraska, University, College of Medicine, Lincoln, Neb.).

IN: ANNUAL ROCKY MOUNTAIN BIOENGINEERING SYMPOSIUM, 6TH, UNIVERSITY OF WYOMING, LARAMIE, WYO., MAY 5, 6, 1969, CONFERENCE RECORD. (A70-12093 02-05)  
New York, Institute of Electrical and Electronics Engineers, Inc., 1969, p. 31-33.

U.S. Department of Transportation Contract No. FH-11-6854.

Discussion of problems connected with the development of a vital function telemetry system. This system involves the transmission of various physiological parameters from an accident victim in an ambulance, ground or airborne, to a computer-and-physician manned monitoring station. These parameters include the ECG, heart rate, blood pressure, respiration rate, and blood flow rate. With this information the physician will then be able to radio instructions on immediate treatment back to the ambulance and prepare a hospital emergency room for prompt action once the ambulance arrives. The computer will be used to constantly monitor the condition of a

patient enroute to the hospital and signal when a dangerous trend or condition develops. A lab mockup of the entire system has been completed. Tests involving the analysis of ECGs over two-way radio have been conducted successfully with easily tolerable noise levels.

M.M.

## A70-12097 #

## MECHANICAL PROPERTIES OF THE SKULL.

Russell R. Haynes, James H. McElhaney, and John L. Fogle (West Virginia University, Biomechanics Laboratories, Morgantown, W. Va.).

IN: ANNUAL ROCKY MOUNTAIN BIOENGINEERING SYMPOSIUM, 6TH, UNIVERSITY OF WYOMING, LARAMIE, WYO., MAY 5, 6, 1969, CONFERENCE RECORD. (A70-12093 02-05)  
New York, Institute of Electrical and Electronics Engineers, Inc., 1969, p. 62-66. 8 refs.

Discussion of experimental investigations of the specification of the mechanical properties of the human skull in sufficient detail to allow the construction of appropriate physical and mathematical models. The experimental results obtained show that an average calvaria or a definite set of average calvaria properties cannot be realized with the sample size employed. A statistical analysis of all the data accumulated shows that variations of properties within the skull, as well as between skulls, is significant at the 5 per cent level. This variation is in part due to the new techniques used in the testing of the material and in the usual amount of variation in biological material properties. Suitable correlations between ultimate strength (radial) and modulus of elasticity (radial as well as tangential) were achieved. In comparing the two parameters in the radial direction and their correlation with bulk density, it is found that the ultimate strength displays a relatively high value of 0.47, while the radial modulus exhibits a correlation of 0.11. An additional property, the modulus of resilience about a radial axis, displays a correlation with the bulk density of 0.05.

M.M.

## A70-12098 #

## SIMULATION OF HORIZONTAL EYE MOVEMENT.

Jack K. Nyquist and W. Fred Ramirez (Colorado, University, Boulder, Colo.).

IN: ANNUAL ROCKY MOUNTAIN BIOENGINEERING SYMPOSIUM, 6TH, UNIVERSITY OF WYOMING, LARAMIE, WYO., MAY 5, 6, 1969, CONFERENCE RECORD. (A70-12093 02-05)  
New York, Institute of Electrical and Electronics Engineers, Inc., 1969, p. 74-77.

Quantitative study of the manner in which the eye positions itself upon an object of interest. Gross anatomical considerations which form the basis for the quantitative mathematical model are given. The model is formulated in terms of a feedback controller with proportional and derivative action. The response for various gains showed that the phase lag in eye motion decreased with increasing gain. A more interesting result was a phase lead observed in the beam image distance from the center of the fovea centralis. This phase lead increases with increasing gain. The results raised some question about just exactly what role derivative control plays in the control of eye motion.

M.M.

## A70-12100 \*

## STUDIES ON p-HYDROXYBENZOATE HYDROXYLASE FROM PSEUDOMONAS PUTIDA.

Barrie Hesp, Melvin Calvin, and Keiichi Hosokawa (California, University, Berkeley, Calif.).

*Journal of Biological Chemistry*, vol. 244, Oct. 25, 1969, p. 5644-5655. 23 refs.

Research supported by the Science Research Council of England and AEC; NIH Grant No. GM-12932-04; Grant No. NGR-04-003-020.

Experimental study of the mechanism of enzymatic hydroxylation of p-hydroxybenzoate hydroxylase from *Pseudomonas putida*.

In anaerobic conditions produced by bubbling helium, the FAD bound to the hydroxylase is reduced stoichiometrically by NADPH in the presence of p-hydroxybenzoate. Procedures for separation and purification of the product are described.

V.Z.

## A70-12119

## ALTERATIONS OF THE HUMAN ELECTROENCEPHALOGRAPH INDUCED BY STRESSFUL VERBAL ACTIVITY.

Jan Berkhout, Donald O. Walter, and W. Ross Adey (California, University, Brain Research Institute, Space Biology Laboratory, Los Angeles, Calif.).

*Electroencephalography and Clinical Neurophysiology*, vol. 27, Nov. 1969, p. 457-469. 19 refs.

NIH Grant No. FR-3; PHS Grant No. NB-02501; Contract No. Nonr-233(91).

Study of the relationship of the EEG to verbal behavior, directed at two specific aspects of this problem—namely, (1) the extent to which the EEG is altered across the definable stages of a verbal exchange, independent of the content, and (2) the extent to which the EEG is altered by the specific information content of given verbal stimuli, or by the different alerting or stress values of a series of such stimuli. Certain auto- and cross-spectral components of EEG appear to be characteristic of responses to verbal stimuli. Employing a discriminant-analysis procedure applied to spectral parameters, it proved to be possible to separate subjectively stressful from nonstressful verbal stimuli, and to determine distinctive EEG responses to verbal stimuli of similar stress value differing only in semantic content. The EEG components characteristic of these response states were consistent over small populations, and the criteria developed for their identification proved valid over several different subjects without requiring individual calibration. Other individual-specific characteristics of the EEG were observed consistently to parallel the cyclical occurrence of several constituent epochs in a 20-item question-answer sequence.

F.R.L.

## A70-12131 #

## EMPIRICAL MEASURES OF PILOT/AIRCRAFT CONTROL DURING FINAL APPROACH TO CARRIER LANDING.

C. A. Briction (Dunlap and Associates, Inc., Santa Monica, Calif.).

IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS AND ERGONOMICS RESEARCH SOCIETY, INTERNATIONAL SYMPOSIUM ON MAN-MACHINE SYSTEMS, ST. JOHN'S COLLEGE, CAMBRIDGE, ENGLAND, SEPTEMBER 8-12, 1969, PROCEEDINGS. VOLUME 2—TRANSPORT SYSTEMS AND VEHICLE CONTROL. (A70-12130 02-21)

New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Conference Record No. 69 C58-MMS), 1969, 15 p. 5 refs. Contract No. Nonr-4984(00).

Empirical study of landing performance of Navy pilots during day and night final approach to landing aboard aircraft carriers. The procedure used, based on the collection and evaluation of landing performance data resulting from over 1600 recorded recoveries and various measures of pilot/aircraft control performance, is described, and the results are discussed. From these landing data, empirical performance criteria were developed and were used to predict the probability of landing success as a function of deviations in final approach performance. Day and night performance criteria when applied to experienced and inexperienced pilots indicate that the probability of landing success can be accurately estimated as a function of performance deviation from the empirical criteria. Other practical applications of the performance data are discussed in terms of pilot training, visual landing aids, and aviation safety.

O.H.



## A70-12132

## SUBJECTIVE RESPONSE TO COMMERCIAL AIRCRAFT RIDE--PASSENGER RIDE QUALITY TESTING.

S. H. Brumaghim (Boeing Co., Wichita, Kan.).  
IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS AND ERGONOMICS RESEARCH SOCIETY, INTERNATIONAL SYMPOSIUM ON MAN-MACHINE SYSTEMS, ST. JOHN'S COLLEGE, CAMBRIDGE, ENGLAND, SEPTEMBER 8-12, 1969, PROCEEDINGS. VOLUME 2--TRANSPORT SYSTEMS AND VEHICLE CONTROL. (A70-12130 02-21)  
New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Conference Record No. 69 C58-MMS), 1969. 12 p.

Preliminary report of the test results obtained in a human vibration test program undertaken to determine airline passenger reaction to vibration environments typical of large commercial aircraft. The test procedure used consisted of seven ride-quality vibration tests to which human subjects were subjected to determine accelerations of vertical and lateral vibration that passengers find objectionable. Interest was confined to reactions to vibration in the frequency range from 0.20 to 7.0 Hz, a range typical of the vibration environment of a large aircraft. The results indicate an increasing sensitivity to vertical vibration as frequency was increased from 1.0 to 7.0 Hz, with the greatest sensitivity in the 4.0- to 7.0-Hz range. The maximum sensitivity to lateral vibration was found to be in the 1.0- to 3.0-Hz range. There was a nearly linear decrease in sensitivity as frequency of lateral vibration was increased from 3.0 to 7.0 Hz. Possible applications of these results include their use in the design of advanced stability augmentation systems to optimize passenger transport ride quality. O.H.

## A70-12136

## ON ESTIMATING THE CAPABILITY OF AN AVIONIC MAN-MACHINE SYSTEM.

A. L. Jones and J. W. Wingert (Honeywell, Inc., Minneapolis, Minn.).  
IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS AND ERGONOMICS RESEARCH SOCIETY, INTERNATIONAL SYMPOSIUM ON MAN-MACHINE SYSTEMS, ST. JOHN'S COLLEGE, CAMBRIDGE, ENGLAND, SEPTEMBER 8-12, 1969, PROCEEDINGS. VOLUME 2--TRANSPORT SYSTEMS AND VEHICLE CONTROL. (A70-12130 02-21)  
New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Conference Record No. 69 C58-MMS), 1969. 14 p.

Description of a technique developed for the quantitative estimation of man-machine capability of helicopter avionic systems, and consideration of the proper procedure for estimating and applying this capability in the evolution of a design from its concept to its procurement. The approach to the development of the technique was based on the use of a common measurable performance parameter--namely, pilot workload--to characterize all the widely diverse flight crew tasks that must be performed during a helicopter mission. The technique proves to be very useful in the quick evaluation of the capability of a wide variety of avionic configurations over a broad spectrum of mission states. A similar approach is recommended for applications that require an estimation of performance capability for a simultaneous combination of many kinds of human tasks. O.H.

## A70-12137

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS AND ERGONOMICS RESEARCH SOCIETY, INTERNATIONAL SYMPOSIUM ON MAN-MACHINE SYSTEMS, ST. JOHN'S COLLEGE, CAMBRIDGE, ENGLAND, SEPTEMBER 8-12, 1969, PROCEEDINGS. VOLUME 3--DECISION MAKING AND MENTAL WORK LOAD; RESEARCH AND DEVELOPMENT TECHNIQUES.  
New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Conference Record No. 69 C58-MMS), 1969. 214 p.

## CONTENTS:

## DECISION MAKING AND MENTAL WORK LOAD.

ON THE FEASIBILITY OF APPLYING PATTERN RECOGNITION CONCEPTS FOR AN AIRCRAFT APPROACH PROGRESS MONITOR. T. E. Brand and C. C. Li (Pittsburgh, University, Pittsburgh, Pa.). 12 p. 10 refs. (See A70-12138 02-21)

A MODEL FOR TASK INTERFERENCE. W. H. Levison (Bolt Beranek and Newman, Inc., Cambridge, Mass.). 16 p. 11 refs. (See A70-12139 02-05)

THE INVESTIGATION OF HUMAN DECISION-MAKING BY MEANS OF MAN-COMPUTER INTERACTION. J. R. Powers (Battelle Memorial Institute, Columbus, Ohio). 8 p. (See A70-12140 02-05)

ON HOW OFTEN THE SUPERVISOR SHOULD SAMPLE. T. B. Sheridan (Massachusetts Institute of Technology, Cambridge, Mass.). 12 p. 5 refs. (See A70-12141 02-15)

ASPECTS OF MENTAL WORKLOAD. T. J. Triggs (Hughes Aircraft Co., Culver City, Calif.). 13 p. 37 refs. (See A70-12142 02-05)

## RESEARCH AND DEVELOPMENT TECHNIQUES.

THE DEVELOPMENT AND OPERATION OF A STORAGE AND RETRIEVAL SYSTEM FOR DIVERSIFIED CREW/EQUIPMENT TASK DATA. H. A. Berry (McDonnell Douglas Corp., Huntington Beach, Calif.). 18 p. (See A70-12143 02-08)

FOOT OPERATION OF CONTROLS--SPEED AND ACCURACY OF FOOT MOTIONS BETWEEN TARGETS. K. H. E. Kroemer. 12 p. (See A70-12144 02-05)

A REMOTE MANIPULATOR SYSTEM FOR SPACE APPLICATIONS. D. A. Kugath (General Electric Co., Schenectady, N.Y.), A. Interian (General Electric Co., Philadelphia, Pa.), and W. H. Allen (NASA, Office of Advanced Research and Technology, Washington, D.C.). 16 p. 9 refs. (See A70-12145 02-03)

MODEL OF A SYSTEM UTILISING HEART RATE TO MONITOR MAN AT WORK IN AN ALIEN ENVIRONMENT. L. E. Morehouse (California, University, Los Angeles, Calif.). 14 p. (See A70-12146 02-05)

## A70-12139 \*

## A MODEL FOR TASK INTERFERENCE.

W. H. Levison (Bolt Beranek and Newman, Inc., Cambridge, Mass.).  
IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS AND ERGONOMICS RESEARCH SOCIETY, INTERNATIONAL SYMPOSIUM ON MAN-MACHINE SYSTEMS, ST. JOHN'S COLLEGE, CAMBRIDGE, ENGLAND, SEPTEMBER 8-12, 1969, PROCEEDINGS. VOLUME 3--DECISION MAKING AND MENTAL WORK LOAD; RESEARCH AND DEVELOPMENT TECHNIQUES. (A70-12137 02-05)

New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Conference Record No. 69.C58-MMS), 1969. 16 p. 11 refs. Contract No. NAS 2-3080.

Description of a model for predicting interference among two or more continuous manual control tasks. The model is based on the assumptions that (1) multiple tasks are performed in parallel, (2) the controller has a fixed number of information-processing channels, and (3) each of these channels is perturbed by a multiplicative, white, Gaussian noise process which is linearly uncorrelated with all other noise processes and system variables. A simple relationship is found between the fraction of total capacity allocated to a control task and the equivalent observation noise associated with that task. The model is able to predict with great accuracy the total performance scores measured in a set of two-axis and four-axis manual tracking experiments. The model structure also accounts for the effects of multiaxis tracking on the human controller's describing function and on the controller remnant spectrum (when reflected as an equivalent observation noise process). A metric for pilot workload is suggested on the basis of these results. (Author)

## A70-12140

## THE INVESTIGATION OF HUMAN DECISION-MAKING BY MEANS OF MAN-COMPUTER INTERACTION.

J. R. Powers (Battelle Memorial Institute, Columbus, Ohio).  
IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS AND ERGONOMICS RESEARCH SOCIETY, INTERNATIONAL SYMPOSIUM ON MAN-MACHINE SYSTEMS, ST. JOHN'S COLLEGE, CAMBRIDGE, ENGLAND, SEPTEMBER 8-12, 1969, PROCEEDINGS. VOLUME 3—DECISION MAKING AND MENTAL WORK LOAD; RESEARCH AND DEVELOPMENT TECHNIQUES. (A70-12137 02-05)

New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Conference Record No. 69 C58-MMS), 1969. 8 p.

Research sponsored by the Battelle Memorial Institute.

Description of a research study conducted to develop procedures for the investigation of human decision making by means of man-computer interaction. The objective was to isolate and define those variables which control or determine effective decision-making performance. Primary emphasis was placed on the development of procedures and computer programs. Guidelines for investigating human decision-making are given, based on an analysis of the basic tasks of decision-makers in "real-world" systems. Experimental decision-making tasks (consistent with the guidelines formulated) permitted controlled investigation of human decision-making behavior. The tasks developed were of a control type, requiring the human to exert control over the system by means of his sequential decisions. One of these tasks was programmed on a time-sharing computer. The computer served to administer the experiment, simulate the system being controlled, and to collect performance data. A pilot study was conducted using the procedures and computer programs developed. A tentative finding was that non-optimal decision-making performance may be partially accounted for by subjects' lack of skill in handling simultaneously several factors relevant to the decision-making problem. (Author)

## A70-12142

## ASPECTS OF MENTAL WORKLOAD.

T. J. Triggs (Hughes Aircraft Co., Display Systems Dept., Culver City, Calif.).

IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS AND ERGONOMICS RESEARCH SOCIETY, INTERNATIONAL SYMPOSIUM ON MAN-MACHINE SYSTEMS, ST. JOHN'S COLLEGE, CAMBRIDGE, ENGLAND, SEPTEMBER 8-12, 1969, PROCEEDINGS. VOLUME 3—DECISION MAKING AND MENTAL WORK LOAD; RESEARCH AND DEVELOPMENT TECHNIQUES. (A70-12137 02-05)

New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Conference Record No. 69 C58-MMS), 1969. 13 p. 37 refs. Contract No. AF 49(638)-1736.

Examination of the task loading of a human operator in terms of a central capacity-sharing model, where the preparatory processes required for task elements in the immediate future are assumed to require information-processing capacity. Experimental data from a serial reaction-time task are presented in support of the model. The results indicate that the preparatory state for a future reaction can be developing prior to emission of the preceding response, and that processing capacity is allocated between the components of the serial task to allow this active process of preparation. Some implications of the model for the measurements of mental workload are discussed.

Z.W.

## A70-12144

## FOOT OPERATION OF CONTROLS—SPEED AND ACCURACY OF FOOT MOTIONS BETWEEN TARGETS.

K. H. E. Kroemer.

IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS AND ERGONOMICS RESEARCH SOCIETY, INTERNATIONAL SYMPOSIUM ON MAN-MACHINE SYSTEMS, ST.

JOHN'S COLLEGE, CAMBRIDGE, ENGLAND, SEPTEMBER 8-12, 1969, PROCEEDINGS. VOLUME 3—DECISION MAKING AND MENTAL WORK LOAD; RESEARCH AND DEVELOPMENT TECHNIQUES. (A70-12137 02-05)

New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Conference Record No. 69 C58-MMS), 1969. 12 p. USAF-sponsored research.

Circular targets, 15 cm between centers, were arranged in rows or columns of three at the reach envelope of the right foot. The subject, sitting on a short chair, moved his right foot as rapidly as possible from one target to an adjacent one. The thigh was kept horizontal while sagittal motions were performed in steps of 15 deg between knee angles of 90 deg (vertical) and 150 deg (forward), or while lateral motions were performed 15 deg to the left or right at each knee angle. Forward motions of the vertical or almost vertical lower leg were slightly faster than either backward or lateral motions of the elevated lower leg. Such discrete motions can be learned very quickly and can be performed in about 0.1 sec. The posture of the lower leg and the direction of motion had no appreciable effect on the accuracy of the motions. (Author)

## A70-12146

## MODEL OF A SYSTEM UTILISING HEART RATE TO MONITOR MAN AT WORK IN AN ALIEN ENVIRONMENT.

L. E. Morehouse (California, University, Human Performance Laboratory, Los Angeles, Calif.).

IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS AND ERGONOMICS RESEARCH SOCIETY, INTERNATIONAL SYMPOSIUM ON MAN-MACHINE SYSTEMS, ST. JOHN'S COLLEGE, CAMBRIDGE, ENGLAND, SEPTEMBER 8-12, 1969, PROCEEDINGS. VOLUME 3—DECISION MAKING AND MENTAL WORK LOAD; RESEARCH AND DEVELOPMENT TECHNIQUES. (A70-12137 02-05)

New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Conference Record No. 69 C58-MMS), 1969. 14 p.

Description of the design and testing of a model of a life-support system which utilizes heart rate to monitor man at work in an alien environment. The model consists of a series of tests to correlate the crewman's heart rate with his (1) responses to moderate and heavy physical work, (2) limits of functional efficiency, (3) maximum oxygen uptake, (4) endurance time at anaerobic threshold, (5) work and recovery while physically fatigued, and (6) work and recovery during elevated body temperatures. To prove the model, work tests in a pressure garment assembly, which includes liquid-cooled suit and a portable life-support system, were performed in a space-environment simulator. Estimations from heart-rate analysis are evaluated. Thermodynamic computations are made of the energy input, output, and waste of the man at work in the closed environment. The individual's work physiology nomogram is constructed. Z.W.

## A70-12147

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS AND ERGONOMICS RESEARCH SOCIETY, INTERNATIONAL SYMPOSIUM ON MAN-MACHINE SYSTEMS, ST. JOHN'S COLLEGE, CAMBRIDGE, ENGLAND, SEPTEMBER 8-12, 1969, PROCEEDINGS. VOLUME 4—ADAPTIVE MAN-MACHINE SYSTEMS; DISPLAY DESIGN.

New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Conference Record No. 69 C58-MMS), 1969. 224 p.

## CONTENTS:

## ADAPTIVE MAN-MACHINE SYSTEMS.

A THEORY OF ADAPTIVE MAN-MACHINE SYSTEMS APPLIED TO AUTOMATED TRAINING. E. M. Connelly and A. R. Schuler (Melpar, Inc., Falls Church, Va.). 15 p. (See A70-12148 02-05)

## DISPLAY DESIGN.

DECISION MAKING AND PATTERN RECOGNITION OF MULTI-DIMENSIONAL DATA. H. C. Andrews (Southern

California, University, Los Angeles, Calif.). 13 p. 20 refs. (See A70-12149 02-08)

HOW DO WE GET FROM THEORY TO PRACTICE? A. C. Busch (U.S. Department of Transportation, Washington, D.C.; Federal Aviation Administration, Atlantic City, N.J.). 15 p. 13 refs. (See A70-12150 02-05)

DEVELOPMENT OF THE APOLLO TELESCOPE MOUNT DISPLAY SYSTEM. C. P. Fazio and L. W. Tobias (Bendix Corp., Denver, Colo.). 14 p. 13 refs. (See A70-12151 02-14)

A NOVEL INTERFACE FOR A MAN-MACHINE DISPLAY SYSTEM. G. L. Kelly and J. A. Lucas (Kansas, University, Lawrence, Kan.). 9 p. (See A70-12152 02-08)

INTERACTIVE GRAPHICAL RESPONSE AND ITS EFFECT ON DISPLAY SYSTEM PERFORMANCE. W. M. Newman (Utah, University, Salt Lake City, Utah). 10 p. 9 refs. (See A70-12153 02-08)

#### A70-12148

##### A THEORY OF ADAPTIVE MAN-MACHINE SYSTEMS APPLIED TO AUTOMATED TRAINING.

E. M. Connelly and A. R. Schuler (Melpar, Inc., Falls Church, Va.). IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS AND ERGONOMICS RESEARCH SOCIETY, INTERNATIONAL SYMPOSIUM ON MAN-MACHINE SYSTEMS, ST. JOHN'S COLLEGE, CAMBRIDGE, ENGLAND, SEPTEMBER 8-12, 1969, PROCEEDINGS. VOLUME 4—ADAPTIVE MAN-MACHINE SYSTEMS; DISPLAY DESIGN. (A70-12147 02-05)  
New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Conference Record No. 69 C58-MMS), 1969. 15 p.

Discussion of automated training for the development of man's dynamic control skills (decision and motion skills) in systems in which he is an element in the loop. A synthesis procedure is described which provides an instantaneous system performance measure that is independent of the mechanism generating the control action. The technique provides a meaningful method for on-line evaluation of man's ability in terms of total man-machine performance. One application of the technique is the automated instruction of man in dynamic situations such as in pilot training. Properties of useful cost indices and methods for their generation from isolated or families of desired system state trajectories are described. A physical interpretation of the characteristics of the resulting performance measure functions is presented. G.R.

#### A70-12150

##### HOW DO WE GET FROM THEORY TO PRACTICE?

A. C. Busch (U.S. Department of Transportation, Washington, D.C.; Federal Aviation Administration, National Aviation Facilities Experimental Center, Atlantic City, N.J.).

IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS AND ERGONOMICS RESEARCH SOCIETY, INTERNATIONAL SYMPOSIUM ON MAN-MACHINE SYSTEMS, ST. JOHN'S COLLEGE, CAMBRIDGE, ENGLAND, SEPTEMBER 8-12, 1969, PROCEEDINGS. VOLUME 4—ADAPTIVE MAN-MACHINE SYSTEMS; DISPLAY DESIGN. (A70-12147 02-05)  
New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Conference Record No. 69 C58-MMS), 1969. 15 p. 13 refs.

Study of parameters involved in testing speech intelligibility and discussion of some of the problems encountered during such testing. Both laboratory intelligibility materials (Modified Rhyme Test) and operational messages (air traffic control and civil disaster vocabularies) were used in testing different voice systems. In each test, both techniques were used and in several cases both rating scale and percent correct reception data were collected. In addition, for the signal-noise conditions used, the Articulation Index was calculated. One of the major subjects of interest was co-channel vs adjacent channel interference in voice communication using both AM and FM

type transmissions. The implications of the results for air traffic and other real world operating communication systems are discussed from the point of view of system performance evaluation and the establishment of performance requirement. G.R.

#### A70-12191 \*

##### THE BIOLOGICAL INERTIAL SYSTEM.

Robert Mayne (Arizona State University, Tempe, Ariz.). IN: RESOURCES ROUNDUP; INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, REGION SIX CONFERENCE, PHOENIX, ARIZ., APRIL 16-18, 1969, TECHNICAL PAPERS. (A70-12177 02-07)

Edited by Russ Bundy.

Phoenix, Ariz., Institute of Electrical and Electronics Engineers, Inc., 1969, p. 209-221. 16 refs.

NASA-supported research.

Outline of the specific contribution of the vestibular sensing system to the sum total of information to central organs by various sensors. A detailed description is given of the anatomy of the vestibular sensing system which includes: (1) an angular movement sensing subsystem consisting of the semicircular canals, (2) a linear movement sensing subsystem consisting of the otolith organs, and (3) signal processing functions. It is shown that the vestibular organs operate independently of vision to supply information about the vertical, the angular velocity of the head, and, either directly or through further central processing, the linear velocity as well, so that central integrations may then yield angular and linear displacements. An integrated system concept of the manner in which the vestibular organs fulfill their functions is presented, particular attention being given to the investigation of the precise nature of the signal issued by the otolith organs (as the linear sensor portion of the system), and of the operations needed to separate this signal into components related, respectively, to gravity and acceleration, from which the orientation of the head and its linear velocity may then be computed. O.H.

#### A70-12304

##### RECEPTIVE FIELDS IN VISUAL SYSTEMS.

Gerald H. Jacobs (Texas, University, Dept. of Psychology, Austin, Tex.).

*Brain Research*, vol. 14, Aug. 1969, p. 553-573. 90 refs.

NSF Grant No. GB-7970.

Review of the present state of knowledge regarding the principles and the characteristics of receptive fields in visual systems. The availability of information concerning receptive field locations is considered. Aspects of size and geometry of receptive fields are examined. Types of specialization for the receptive fields are described, and areal and temporal interactions are discussed. The effects of adaptation are investigated. Findings regarding sensory interactions are described. The study of neural channels as inputs to cells and the rules for the combination of those inputs are discussed. Aspects of functional anatomy are considered, and relations to psychophysics are explored. G.R.

#### A70-12321

##### OPTIMAL AND SUBOPTIMAL DECISIONS IN PERCEPTUAL PROBLEM-SOLVING TASKS.

Amnon Rapoport (North Carolina, University, Dept. of Psychology, Chapel Hill, N.C.).

*Behavioral Science*, vol. 14, Nov. 1969, p. 453-466. 18 refs.

Research supported by the Kaplan School of Economics and the American Psychological Foundation.

Certain perceptual problem-solving tasks can be formulated as multistage decision-making problems. The dynamic programming approach can then be used to find the optimal decisions. When constraints are imposed on the problem-solver's ability to scan his environment and to process information, simple algorithms for solving the problem can be constructed. The algorithms yield

suboptimal solutions that may adequately describe the problem-solver's behavior. Elithorn's perceptual maze test is reanalyzed and the results of an illustrative experiment are presented and discussed. (Author)

## A70-12322 \* #

## COCHLEAR HAIR-CELL DAMAGE IN GUINEA PIGS AFTER EXPOSURE TO IMPULSE NOISE.

Lynn B. Poche, Jr., Charles W. Stockwell, and Harlow W. Ades (Illinois, University, Dept. of Electrical Engineering, Urbana, Ill.).

*Acoustical Society of America, Journal*, vol. 46, Oct. 1969, pt. 2, p. 947-951. 10 refs.

NASA-supported research.

Study of 14 young guinea pigs who were individually exposed to 500 rounds of paper "caps" fired in a toy gun at a distance of 30 cm. The gun was fired at intervals of 1 to 5 sec. After seven weeks survival, the cochleas were removed, and each complete organ of Corti examined, using Engström's surface-preparation technique. Cochleograms (tabular forms showing position and condition of each cell) were prepared for each row of hair cells. Curves were plotted showing the number of damaged cells as a function of distance from the base. In approximately 80 per cent of the cases, total destruction of hair cells occurred in a narrow band midway along the organ of Corti. The severity and distribution of damage for the group are compared with similar data for another group, which was exposed to high-intensity pure tones. (Author)

## A70-12323 #

## TRAVELING-WAVE VELOCITY IN THE HUMAN COCHLEA.

Stanley Zerlin (Chicago, University, Otolaryngology Section, Chicago, Ill.).

*Acoustical Society of America, Journal*, vol. 46, Oct. 1969, pt. 2, p. 1011-1015. 11 refs.

NIH-supported research.

Use of a number of equally loud tonal pairs of somewhat different frequency to determine traveling-wave velocity along various short segments of cochlear partition. Averaged estimates from three trained listeners showed wave velocity decreasing from about 30 m/sec on the higher-frequency portion of the partition to approximately 1.0 m/sec near the low-frequency end. Results are compared with some psychophysical and electrophysiological findings. F.R.L.

## A70-12324 #

## CORRELATION CHARACTERISTICS AND DIMENSIONALITY OF SPEECH SPECTRA.

K.-P. Li, G. W. Hughes, and A. S. House (Purdue University, Lafayette, Ind.).

*Acoustical Society of America, Journal*, vol. 46, Oct. 1969, pt. 2, p. 1019-1025. 10 refs.

USAF-supported research.

Use of statistical properties of spectral samples derived from the continuous speech of six talkers and summarized by means of covariance-matrix eigenvectors to study the dimensionality of the data space. The importance of eliminating low-level samples by means of a fixed threshold is emphasized, and criteria for selecting such a threshold are presented. Measurements of spectral correlations stabilize after about 30 sec of speech, suggesting that short-term examination of a talker's output may prove sufficient to calculate parameters useful in recognition schemes. Some features of the correlation matrix, which are readily displayed via isocorrelation contours, appear to be related to talker characteristics, while others are talker-independent. The results suggest that the separation of speech data into gross classes prior to the application of statistical procedures will enhance the performance of processing schemes. (Author)

## A70-12377

## COMPLEX VIGILANCE-RELEVANT AND IRRELEVANT SIGNALS.

Irwin L. Goldstein (Maryland, University, Dept. of Psychology, College Park, Md.), William A. Johnston, and William C. Howell (Ohio State University, Columbus, Ohio).

*Journal of Applied Psychology*, vol. 53, Feb. 1969, pt. 1, p. 45-48. 7 refs.

Contract No. AF 30(602)-3622.

Human monitors were required to detect additions and deletions of experimentally defined relevant signals which were presented via a computer on an 8 by 8 matrix display. The ratio of relevant to irrelevant stimuli on the display (20:10, 15:15, 10:20) and ratio of relevant to irrelevant signals or changes (40:20, 20:40 per 100-min period) were investigated. Vigilance decrements were found in the detection of omit signals with the greatest decrements occurring in the experimental condition where the proportion of relevant to irrelevant signal changes was smallest. (Author)

## A70-12378 \*

## ORGANIZATIONAL FACTORS AND INDIVIDUAL PERFORMANCE—A LONGITUDINAL STUDY.

George F. Farris (Michigan, University, Ann Arbor, Mich.).

*Journal of Applied Psychology*, vol. 53, Apr. 1969, pt. 1, p. 87-92. 6 refs.

Grant No. NsG-489-28-014.

Stability of relationships and time lags in measurement were investigated using information collected at two points in time about organizational factors and the performance of 151 engineers. Four measures of performance were correlated with six organizational factors: involvement in work, influence on work goals, colleague contact, diversity of work activities, salary, and number of subordinates. On the basis of low but statistically significant associations, it was found that correlations between organizational factors and performance were generally stable with a six-year interval between measurements. Surprisingly, relationships were consistently stronger when performance was measured before the organizational factor. It was concluded that changes in organizational factors which follow performance should be considered in research design, organizational theory, and, especially, in interpretations of "simultaneous" associations between organizational factors and performance. (Author)

## A70-12379 #

## EXPERIENCE AND PRIOR PROBABILITY IN A COMPLEX DECISION TASK.

Michael H. Strub (Ohio State University, Human Performance Center, Columbus, Ohio).

*Journal of Applied Psychology*, vol. 53, Apr. 1969, pt. 1, p. 112-117. 17 refs.

Contract No. AF 33(615)-2248.

Six experienced and six naive subjects evaluated probabilistic data, determined sources of data generation, and predicted subsequent data in a complex decision task. Experience and prior probability were combined factorially. Results indicated that experienced subjects (1) were less conservative data evaluators, (2) determined data sources on the basis of fewer data samples, (3) were more sensitive to prior-probability values, and (4) adopted a maximization strategy in prediction more consistently than did naive subjects. The importance of using trained personnel in the evaluation of realistic decision capabilities and the need for caution in generalizing from data obtained from naive subjects who serve in most laboratory studies of decision making are discussed. (Author)

## A70-12380

## AUTOMATED INSTRUCTION FOR VIGILANCE TRAINING.

Dennis A. Attwood (Defence Research Board, Defence Research Establishment, Toronto, Canada) and Earl L. Wiener (Miami, University, Dept. of Industrial Engineering, Coral Gables, Fla.).

*Journal of Applied Psychology*, vol. 53, June 1969, pt. 1, p. 218-223. 15 refs.

PHS Grant No. UI-00014.

The performance of subjects trained in a visual monitoring task with an autoinstructional device was compared with that of subjects trained by practice alone. The experimental group had three 50-min training sessions on a device which included the standard monitoring task, but allowed the subject to select his signal schedule, to call for immediate knowledge of results, or signal cueing (prompting), or both, and to test himself with no training aids available. Subsequent testing on the standard task revealed that subjects trained with autoinstruction showed a much higher detection rate than the control group, with no increase in commissive errors. Reasons for the success of autoinstruction in vigilance training are discussed. (Author)

#### A70-12381

##### COLOR CODING EFFECTS IN COMPATIBLE AND NONCOMPATIBLE DISPLAY-CONTROL ARRANGEMENTS.

Gary K. Poock (U.S. Naval Postgraduate School, Monterey, Calif.). *Journal of Applied Psychology*, vol. 53, Aug. 1969, p. 301-303. 8 refs.

Description of an experiment designed to assess the effect of color coding in compatible and noncompatible display-control arrangements. Forty subjects viewed four arrangements of display-control panels with color coding or no color coding, and with displays and controls arranged in either a compatible or noncompatible arrangement. The subjects' task was to shut off the display as fast as possible for 80 trials. Color coding was more effective when displays and controls were arranged in a noncompatible fashion, and had no effect when display and control were arranged in a compatible manner. The results support the importance of compatibility in display-control location. (Author)

#### A70-12382

##### FEEDBACK AND RESPONSE MODE IN PERFORMING A BAYESIAN DECISION TASK.

David W. Martin and Charles F. Gettys (Ohio State University, Columbus, Ohio). *Journal of Applied Psychology*, vol. 53, Oct. 1969, p. 413-418. Contract No. AF 33(615)-2248.

In a complex decision-making situation, subjects received data generated by one of three hypotheses according to specified conditional probabilities. The subjects inferred which hypothesis had generated the data or estimated the probability of each hypothesis given the data. Feedback was given after each trial either as the hypothesis which generated the data or the probability that each hypothesis generated the data calculated by Bayes' theorem. The two response conditions and two feedback conditions were combined factorially with a group of 16 subjects making 200 responses in each condition. The percentage of trials choosing the most probable hypothesis was significantly higher for the groups responding with a single hypothesis than for the probability response groups, and higher for the Bayesian probability feedback groups than for the groups receiving no feedback. The Bayesian probability feedback group also gave probability responses which were much closer to the optimal probabilities than did the no-feedback group. (Author)

#### A70-12395 \*

##### OBJECT-CARRYING BY RATS—AN APPROACH TO THE BEHAVIOR PRODUCED BY BRAIN STIMULATION.

Anthony G. Phillips, Verne C. Cox, Jan W. Kakolewski, and Elliot S. Valenstein (Fels Research Institute, Yellow Springs, Ohio). *Science*, vol. 166, Nov. 14, 1969, p. 903-905. 7 refs. NASA-supported research; NIH Grant No. M-4529.

Rats were provided with opportunity to turn reinforcing hypothalamic stimulation on and off by traversing back and forth across a chamber. When provided with edible and inedible objects, all

animals that self-stimulated carried them from the stimulation to the nonstimulation side. Neither food deprivation nor a history of stimulus-bound eating produced a preference for the edible objects. Equivalent stimulation provided without regard to the animals' location in the chamber did not elicit object-carrying. Results are interpreted in terms of the natural conditions which normally elicit this species-specific unit of behavior. Implications for understanding other behavior patterns elicited by hypothalamic stimulation are suggested. (Author)

#### A70-12457 \* #

##### PROPAGATION VELOCITY OF LATERAL INTERACTION IN THE HUMAN VISUAL SYSTEM.

Robert A. Smith and Whitman Richards (Massachusetts Institute of Technology, Dept. of Psychology, Cambridge, Mass.).

*Optical Society of America, Journal*, vol. 59, Nov. 1969, p. 1469-1472. 17 refs.

NIH Grant No. MH-05673; Contract No. AF 44(620)-67-C-0085; Grant No. NSG-496.

Determination of the relationship between the propagation distance and the time delay in the human visual system, using three different sets of line stimuli, each having a different spatial distance over which the interaction must propagate. It is found that the interactions between the line stimuli include luminance-threshold effects that are delayed in time, with the delay depending on the spatial separation between the contours. These delayed effects can be accounted for by lateral interactions that propagate with a velocity of about 0.65 deg/sec. Z.W.

#### A70-12458 #

##### CRITICAL DURATION FOR THE PUPILLARY LIGHT REFLEX.

John G. Webster (Rochester, University, Dept. of Electrical Engineering, Rochester, N.Y.).

*Optical Society of America, Journal*, vol. 59, Nov. 1969, p. 1473-1478. 15 refs.

NIH Grant No. NB-00618.

Light reflexes of the eye pupil are measured with an IR scanning pupillometer in response to a 74-deg field. At threshold, the pupillary system responds to stimulus energy for short flashes and stimulus magnitude for long flashes. On a plot of log-flash magnitude vs log-flash duration, the intersection of the constant-energy asymptote and the constant-magnitude asymptote is defined as the critical duration. The critical duration was measured at threshold for the pupillary light reflex and visual perception, using seven subjects and three background levels. The critical durations were about 70 msec for most tests, but were shorter for very high backgrounds and longer with no background. Since other investigators have shown that the critical duration cannot be determined within the receptor, this suggests that the pupillary light reflex and visual perception share common temporal processing involving the nervous system beyond the receptor level. (Author)

#### A70-12460

##### SPATIOTEMPORAL CHROMATICITY DISCRIMINATION.

Gerard J. C. van der Horst and Maarten A. Bouman (Utrecht, State University, Dept. of Medical and Physiological Physics, Physics Laboratory, Utrecht, Netherlands).

*Optical Society of America, Journal*, vol. 59, Nov. 1969, p. 1482-1488. 24 refs.

Research supported by the Netherlands Organization for the Advancement of Pure Research and the N. V. Philips Gloeilampenfabrieken.

Investigation of the threshold visibility of uniformly moving colored gratings. The gratings were equiluminous sine-wave patterns, generated on a color-television display. The traveling waves were detected by the subject over a range of three log units of background illuminance, including various spatial- and temporal-frequency combinations. The experiments indicate that no resonance phenomena

occur in the spatial-temporal color-discrimination system of the eye. This system probably functions as a low-pass filter. The color coding takes place in much narrower frequency bands than the brightness coding. A regular motion of the pattern never enhances the visibility of the color gratings. The temporal characteristics of the chromatic-discrimination system show very much resemblance to its spatial qualities. Experiments show that the threshold chromatic contrast is proportional to the square root of the illuminance. This fundamental relationship can easily be understood from the statistical properties of the photons, absorbed in the differential receptor systems.

(Author)

## A70-12463

## RECIPROCITY OF THE EYE TO 665-NM FLASHES.

Z. Szilagyi (North American Philips Co., Inc., Philips Laboratories Div., Briarcliff Manor, N.Y.).

*Optical Society of America, Journal*, vol. 59, Nov. 1969, p. 1495, 1496. 5 refs.

Experimental determination of the ability of the eye to integrate flashes of a monochromatic light lasting from .01 sec to 1 microsec at television-frame frequencies. For this purpose, a solid-state light source is employed as a variable-duration and constant-frequency stimulus. The reciprocity of the eye is demonstrated by a plot of peak-flash irradiance at the eye of the observer vs flash duration.

Z.W.

## A70-12466

## SCALING AND REFRACTORINESS IN PULSE TRAINS.

Horace B. Barlow (California, University, Dept. of Physiology-Anatomy, Berkeley, Calif.).

*Optical Society of America, Journal*, vol. 59, Nov. 1969, p. 1500. 6 refs.

Discussion of Trabka's (1969) criticism of results obtained by Barlow (1965) concerning the effect of scaling on the incremental sensitivity of the eye. After pointing out some errors in Trabka's reasoning, it is noted that scaling and refractoriness are not appropriate concepts to apply to intraretinal mechanisms, although they may be important considerations when neural information is transmitted over long distances and all-or-none impulses are used.

Z.W.

## A70-12467

## INFRASONICS.

R. W. B. Stephens (London, University, Imperial College of Science and Technology, Dept. of Physics, London, England).

*Ultrasonics*, vol. 7, Jan. 1969, p. 30-35. 23 refs.

Discussion of the health hazards and physiological effects of infrasonic waves propagating in the atmosphere at frequencies below the normal hearing range. Approximate frequency ranges of physiologically disturbing vibrations caused by aircraft, air cushion craft, bridges, and vehicles, machine tools, ships, and space vehicles are estimated. The design and operation of the Solion, an electrochemical device for detecting infrasonic waves, are described. It is pointed out that ordinary ear protecting devices are ineffective in the infrasonic range at frequencies from 1 to 100 Hz. Further studies of the symptoms produced by infrasound are suggested.

V.Z.

## A70-12512 \*

## MECHANICAL AND DYNAMIC IMPLICATIONS OF DIMENSIONAL MEASUREMENTS OF THE LEFT VENTRICLE.

Harold Sandler and Dhanjoo N. Ghista (NASA, Ames Research Center, Moffett Field, Calif.).

(Federation of American Societies for Experimental Biology, Annual Meeting, 52nd, Symposium on Dynamic Geometry of the Left Ventricle, Atlantic City, N.J., Apr. 16, 1968.)

*Federation Proceedings*, vol. 28, July-Aug. 1969, p. 1344-1350. 25 refs.

PHS Grant No. HE-03391.

Study aimed at relating generated or imposed forces which tend to alter ventricular geometry with the resulting change in shape during the cardiac cycle. The results obtained with spherical and elliptical models are diagrammed and discussed. The shell of muscle comprising the intact left ventricular chamber is characterized in terms of stress-strain and stress vs rate of strain, while the elastic modulus and the Poisson ratio are taken as the main transfer function for characterizing the wall properties. The results obtained for subjects with pure mitral valve disease, subjects with aortic valve disease, and subjects with primary myocardial disease are tabulated.

V.P.

## A70-12517 \*

SPACE-FLIGHT ENHANCEMENT OF IRRADIATION EFFECTS IN THE FLOUR BEETLE, *TRIBOLIUM CONFUSUM*.

John V. Slater, B. Buckhold, and C. A. Tobias (California, University, Donner Laboratory of Medical Physics and Biophysics, Berkeley, Calif.).

*Radiation Research*, vol. 39, July 1969, p. 68-81. 21 refs.

NASA-supported research; AEC Contract No. W-12-792(02).

The space environment and radiation on Biosatellite 2 significantly enhanced two radiation effects in the developing flour beetle, *Tribolium confusum*. A developmental wing abnormality, appearing in adults following pupal irradiation, was increased to 44.8 per cent in flight, compared with control incident of 29.9 per cent. Similarly, dominant lethals of offspring of females irradiated in space increased significantly to 78 per cent from 27 per cent on the ground. Postflight ground control tests indicate that weightlessness, not acceleration or vibration, was the contributing factor. The duration of the pupal stage was unaffected. All pupae were between 19 and 27 hours old at launch and were preirradiated with 1350 r of 180-keV X-rays to place them into their sensitive dose range. Total irradiation received in space was approximately 950 r.

(Author)

## A70-12545

## BLOOD FLOW IN THE CAPILLARY BED.

Y. C. Fung (California, University, La Jolla, Calif.).

(American Society of Mechanical Engineers, Biomechanical and Human Factors Division Conference, 3rd, University of Michigan, Ann Arbor, Mich., June 12, 13, 1969.)

*Journal of Biomechanics*, vol. 2, Oct. 1969, p. 353-372. 57 refs.

NSF Grant No. GK-10553; Grant No. AF AFOSR 1186-67.

General survey of recent works on capillary blood flow. Some details are presented for two problems: the problem of deformation of the flexible red blood cells, their motion in the capillary blood vessels, and the pressure drop due to the red cell-blood vessel interaction; and the problem of the flow of plasma "bolus" between neighboring red cells. The solution supplies many details about the microcirculation phenomenon. Taken together, a method is offered for the calculation of pressure drop in the capillary as a function of various physical parameters: the red cell volume per unit blood volume (hematocrit), the ratio of the cell diameter to the blood vessel diameter, the volume of individual red cells, and a parameter relating the cell membrane elasticity with plasma viscosity and the cell velocity.

(Author)

## A70-12546

## AN EXPERIMENTAL AND ANALYTIC STUDY OF THE DYNAMIC PROPERTIES OF THE HUMAN LEG.

Charles A. Moffatt (Technology, Inc., San Antonio, Tex.), Edward H. Harris, and Edward T. Haslam (Tulane University, New Orleans, La.).

(American Society of Mechanical Engineers, Biomechanical and Human Factors Division Conference, 3rd, University of Michigan, Ann Arbor, Mich., June 12, 13, 1969.)

*Journal of Biomechanics*, vol. 2, Oct. 1969, p. 373-387. 13 refs.

Certain problems in the dynamics of the human body are characterized by large displacements of body parts compared to the

deformations of the tissues themselves. In such problems, it is convenient to think of the human body as a chain of rigid links, representing the anatomical segments, with joints between the rigid links representing the articulations of the human body. Skeletal muscles are capable of creating torques at the joints of the body. The joint torques of the rigid link model should portray the static strength of skeletal muscle, the degradation of muscle strength with rate of shortening, the feedback control of the stretch reflex, and the viscoelastic properties of the muscles, tendons, and joint capsules. In this study a sinusoidal test is performed upon the knee joints of nine subjects. The increment of knee moment required to flex and extend the knee slightly for various conditions of knee angle, knee angular velocity, and steady knee moment is measured. The hip angle is maintained constant. After the effects of leg inertia are removed, the resulting data are shown to obey a Maxwell fluid model in which the model coefficients depend upon the absolute value of the knee moment. (Author)

**A70-12547 \***  
**THE PHYSICAL CHARACTERISTICS OF ERYTHROCYTE SETTLING IN A LIQUID MEDIUM.**

R. R. Burton, S. J. Sluka, R. B. Krone, and A. H. Smith (California, University, Dept. of Animal Physiology and Civil Engineering, Davis, Calif.).

*Journal of Biomechanics*, vol. 2, Oct. 1969, p. 389-396. 23 refs.  
 Grant No. NGR-05-004-008.

Erythrocyte sedimentation was observed in chicken blood with the aid of a microscope. It was determined that the velocity of an ellipsoid shaped cell (chicken erythrocyte) sedimenting in a dilute suspension of cells can be predicted by Stokes' equation—i.e., it obeys Stokes' law using the calculated "effective radius" which is defined. Sedimentation of cells in suspensions having greater than 0.003 per cent packed cell volume was characterized by reversing currents resulting from an interaction between the erythrocytes and the liquid medium. Eliminating these currents did not affect the overall erythrocyte sedimentation rate, however. (Author)

**A70-12548**  
**HEAD TRAUMA—A PARAMETRIC DYNAMIC STUDY.**

Sanford B. Roberts, Carley C. Ward, and Alan M. Nahum (California, University, Los Angeles, Calif.).

(*American Society of Mechanical Engineers, Biomechanical and Human Factors Division Conference, 3rd, University of Michigan, Ann Arbor, Mich., June 12, 13, 1969.*)

*Journal of Biomechanics*, vol. 2, Oct. 1969, p. 397-415. 12 refs.  
 National Highway Safety Bureau Contract No. FH-11-6690.

Development of a mathematical elastodynamic model, Baseline I, consisting of eleven degrees of freedom and describing the human skull, brain, spinal cord, neck, arms, and torso as a system of discrete masses, and linear translational and torsional springs. Forced response solutions to the governing equations of motion, which contain selected nonlinear terms, are carried out on the IBM 7094 computer. A parametric study was conducted of the effects of location and force-time history of a blow to the head and of variations in neck stiffness. The significance of these perturbations is determined by comparison with selected response measures. (Author)

**A70-12549**  
**A COMPUTERIZED BIOMECHANICAL MODEL—DEVELOPMENT OF AND USE IN STUDYING GROSS BODY ACTIONS.**

Don B. Chaffin (Michigan, University, Dept. of Industrial Engineering, Ann Arbor, Mich.).

(*American Society of Mechanical Engineers, Biomechanical and Human Factors Division Conference, 3rd, University of Michigan, Ann Arbor, Mich., June 12, 13, 1969.*)

*Journal of Biomechanics*, vol. 2, Oct. 1969, p. 429-441. 37 refs.  
 Research sponsored by the Western Electric Co.

Gross body actions involved in heavy industry (lifting and carrying materials) are often the cause of injury to the musculoskeletal system. A computer model is developed which treats the human body as a series of seven links from which reactive forces and torques are computed at each articulation during various simulated materials handling tasks. In addition, an analysis of shearing and compressing forces at the lower lumbar spine is included. The assumptions of the present model are presented, along with a discussion of future models. (Author)

**A70-12550 \***  
**A THICK-WALLED VISCOELASTIC MODEL FOR THE MECHANICS OF ARTERIES.**

N. R. Kuchar (General Electric Co., Space Sciences Laboratory, Philadelphia, Pa.) and S. Ostrach (Case-Western-Reserve University, Div. of Fluid, Thermal and Aerospace Sciences, Cleveland, Ohio).

(*American Society of Mechanical Engineers, Biomechanical and Human Factors Division Conference, 3rd, University of Michigan, Ann Arbor, Mich., June 12, 13, 1969.*)

*Journal of Biomechanics*, vol. 2, Oct. 1969, p. 443-454. 20 refs.

Research supported by the Heart Association of Northeastern Ohio; Grant No. NGR-36-003-088.

A knowledge of the mechanics of arteries is of importance in the determination of vessel rheological properties and in the studies of blood flow and certain arterial diseases. An arterial model is described which includes the effects of thick walls, linear viscoelasticity, and wall tethering. The forms of the displacements and stresses are found independently of the exact form of the applied fluid stresses; thus, the results are applicable to a range of possible dynamical conditions. Displacements and stress states can then be found from experimental or theoretical knowledge of the blood pressure and flow. The results are applied to flow development and wave propagation regions in the arteries. (Author)

**A70-12581**  
**QUANTITATIVE EVALUATION OF THE BIOLOGICAL DAMAGE CAUSED BY IRRADIATION (L'EVALUATION QUANTITATIVE DU DOMMAGE BIOLOGIQUE PRODUIT PAR L'IRRADIATION).**

G. Marble and L. Breuil (Ministère des Armées, Service de Santé, Paris, France).

*Revue des Corps de Santé des Armées*, vol. 10, Aug. 1969, p. 445-463. 37 refs. In French.

Discussion of the principles of biological dosimetry, including an evaluation of the technique and a review of its applications. The deficiency of physical dosimetry is demonstrated, and the principles of biological dosimetry are presented. The individual biological dosimetric techniques are described. Attention is given to the biochemical, hematological, and neurophysiological techniques which are usually complemented by clinical observations. Applications of these techniques in biological dosimetry are briefly assessed. Z.W.

**A70-12622**  
**LONG-TERM MEMORY EFFECTS IN THE PERCEPTION OF APPARENT MOVEMENT.**

Larry M. Raskin (Purdue University, Lafayette, Ind.).

*Journal of Experimental Psychology*, vol. 79, Jan. 1969, pt. 1, p. 97-103. 19 refs.

Defence Research Board of Canada Grant No. 9401-11; PHS Grant No. MH-02455.

Demonstration of long-term memory effects in visual perception with the illusion of apparent movement. It was found that prior experience received as long as one week before a test session can either facilitate or interfere with the subsequent perception of the illusion. Forms previously seen as moving continued to be seen as moving when presented in sequence with a very dissimilar form, a

condition in which apparent movement is not usually seen. Forms previously seen as stationary continued to be seen as stationary when later presented in sequence with an identical form, a condition favoring the perception of apparent movement. The results were interpreted in terms of perceptual learning. (Author)

## A70-12623

## MONOCULAR RECOGNITION OF LETTERS AND LANDOLT Cs IN LEFT AND RIGHT VISUAL HEMIFIELDS.

Howard Markowitz (Connecticut College for Women, New London, Conn.) and Donald O. Weitzman (U.S. Navy, Naval Submarine Medical Center, Groton, Conn.).

*Journal of Experimental Psychology*, vol. 79, Jan. 1969, pt. 1, p. 187-189. 12 refs.

Contract No. N 00014-67-C-0466.

Experimental investigation of the hypothesis that superiority of right over left visual field presentations are limited to the left eye with monocular viewing of letters. The experiment established that this pattern of results is to be explained in terms of an interaction of visual acuity and right superiority. The findings suggest that acuity must be considered in combination with other variables among the determinants of hemifield differences in perceptual accuracy. M.M.

## A70-12624 \*

## FUNCTIONAL IDENTIFICATION OF PERCEPTUAL AND RESPONSE BIASES IN CHOICE REACTION TIME.

David LaBerge, Ross Legrand, and Russell K. Hobbie (Minnesota, University, Minneapolis, Minn.).

*Journal of Experimental Psychology*, vol. 79, Feb. 1969, pt. 1, p. 295-299. 7 refs.

NSF Grant No. GS-541; Grant No. NGR-24-005-063.

A two-choice speeded identification task involved two stimuli associated with one response, and a third stimulus associated with the other response. In the first experiment, the relative frequency of one of the pair of stimuli associated with one response was increased progressively. In a second experiment, this stimulus was given additional emphasis by presenting a mild noise burst following fast correct responses. Comparisons of response latencies to the three stimuli indicated that both perceptual and response biases operate in this situation. (Author)

## A70-12626

## INTERACTION OF FACTORS AFFECTING SPACE LOCALIZATION.

Paul Meisel and Seymour Wapner (Clark University, Worcester, Mass.).

*Journal of Experimental Psychology*, vol. 79, Mar. 1969, pt. 1, p. 430-437. 7 refs.

PHS Grant No. MH-00348.

Study of the problem of interaction of sensory and muscular factors in space perception through an empirical test of a summative hypothesis derived from sensory-tonic field theory. A number of criteria for adequate testing of the hypothesis are described and are used in evaluating the findings of an experiment testing interaction by assessing the effect of perceived position of the median plane (straight ahead) of variation of asymmetry of extent of a stimulus figure and asymmetry of ocular convergence. While the results indicate that for interaction of these two factors certain criteria for summation are met, the most stringent criterion, relating to identity between predictor and observed values, is not satisfied. The findings suggest directions for possible theoretical reformulation of the summative hypothesis, including consideration of individual differences and of limitations to the responsiveness of the organism. (Author)

## A70-12627 \*

## RESPONSE TIMES WITH NONAGING FOREPERIODS.

Raymond S. Nickerson (Bolt Beranek and Newman, Inc., Cambridge, Mass.) and David W. Burnham (USAF, Electronic Systems Div., Bedford, Mass.).

*Journal of Experimental Psychology*, vol. 79, Mar. 1969, pt. 1, p. 452-457. 13 refs.

NASA-supported research.

Study of foreperiods (FPs) generated in such a way that the probability of the immediate termination of an FP was independent of its age. Under these conditions mean response time increased linearly with mean or expected FP when the latter was varied from 250 msec to 32 sec. (Author)

## A70-12628

## MULTIPLE-COMPONENT HEART RATE RESPONSES CONDITIONED UNDER PACED RESPIRATION.

Mary W. Headrick (Vanderbilt University, Nashville, Tenn.) and Frances K. Graham (Wisconsin, University, Madison, Wis.).

*Journal of Experimental Psychology*, vol. 79, Mar. 1969, pt. 1, p. 486-494. 19 refs.

NIH Grants No. MH-02011; No. HD-01490; No. K3-MH-21762.

Study of three groups of human subjects given differential conditioning trials with respiration uncontrolled, controlled at normal rates, or controlled at rapid rates. Significant differential heart rate responding occurred in all groups and, except in the rapid breathing group, improved across trials. Respiration did not affect the form of the conditioned response. There were three significant components: deceleration immediately following conditioned stimulus onset, subsequent brief acceleration, and marked deceleration just prior to unconditioned stimulus onset. Analysis indicated that the triphasic response was neither a homeostatic adjustment nor an unconditioned orienting response. Discrepant findings in earlier studies may be largely explained by experimental conditions that differentially affect the three components. (Author)

## A70-12669 \* #

## MEDICAL EXPERIENCE IN THE APOLLO MANNED SPACE FLIGHTS 7 TO 11.

Charles A. Berry (NASA, Manned Spacecraft Center, Houston, Tex.). *International Congress of Aerospace Medicine, 18th, Amsterdam, Netherlands, Sept. 15-18, 1969, Paper. 71* p. 10 refs.

Discussion of the knowledge gained on man's response to the space environment during 3105 man-hours of space flight experience during the Apollo program. Topics discussed include the actual and spacecraft environment, effects of acceleration and impact, radiobiology, toxicology, and general weightlessness. Special attention is given to the problems of food, and water and waste management. The physical examinations of astronauts, as well as preventive medicine and in-flight diseases, are discussed. Z.W.

## A70-12675

## BALLISTOCARDIOGRAPHY AND CARDIOVASCULAR PERFORMANCE; BALLISTOCARDIOGRAPH RESEARCH SOCIETY, ANNUAL MEETING, 13TH, ATLANTIC CITY, N.J., MAY 4, 1968, PROCEEDINGS.

Edited by Isaac Starr (Pennsylvania, University, Hospital, Dept. of Therapeutic Research, Philadelphia, Pa.).

Basel, Switzerland, S. Karger AG (*Bibliotheca Cardiologica*, no. 24), 1969. 123 p.

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**ANALYSIS OF THE EFFECT OF POSTURE ON THE BCG.** P. D. Verdouw, N. Westerhof, and A. Noordergraaf (Pennsylvania University, Philadelphia, Pa.), p. 75-84. 12 refs. (See A70-12684 02-05)

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#### A70-12676

**THE UNITAGE USED FOR THE DISPLAY OF BALLISTOCARDIOGRAPHIC AMPLITUDES.**

R. Proper (Lovelace Foundation for Medical Education and Research, Dept. of Diagnostics and Clinical Biometrics, Albuquerque, N. Mex.).

IN: BALLISTOCARDIOGRAPHY AND CARDIOVASCULAR PERFORMANCE; BALLISTOCARDIOGRAPH RESEARCH SOCIETY, ANNUAL MEETING, 13TH, ATLANTIC CITY, N.J., MAY 4, 1968, PROCEEDINGS. (A70-12675 02-04)

Edited by Isaac Starr.

Basel, Switzerland, S. Karger AG (*Bibliotheca Cardiologica*, no. 24), 1969, p. 3-6. 5 refs.

Attempt to demonstrate the usual methods and units used to display quantitative ballistocardiographic data. The data used have evolved from the testing of 450 professional pilots who have been shown to be free of all evidence of cardiovascular disease. Their ages range from 20 to 60 years. Both displacement and acceleration data were obtained, the display of the latter being more complicated than that for simple displacement. F.R.L.

#### A70-12677

**ABSOLUTE VALUE ULF BALLISTIC FORCES AS INDICES OF PULSATILE FLUID PUMPING.**

J. Nyboer (Wayne State University, School of Medicine, Rehabilitation Institute and Dept. of Physiology and Pharmacology, Detroit, Mich.).

IN: BALLISTOCARDIOGRAPHY AND CARDIOVASCULAR PERFORMANCE; BALLISTOCARDIOGRAPH RESEARCH SOCIETY,

ANNUAL MEETING, 13TH, ATLANTIC CITY, N.J., MAY 4, 1968, PROCEEDINGS. (A70-12675 02-04)

Edited by Isaac Starr.

Basel, Switzerland, S. Karger AG (*Bibliotheca Cardiologica*, no. 24), 1969, p. 7-12.

Definition of the role of absolute ballistocardiogram (BCG) forms and their area summation as they may apply to cardiodynamic function, including flow indices. A servo-loop BCG amplifier produces acceleration and force BCGs without resorting to direct differentiation of a velocity signal. A new approach to cardiobalistics study was made by the absolute forms of pulsatile dynamics. The slope or area summation of the absolute forms of the given velocity bears a high functional correlation to the absolute stroke volume produced by pulsing and flowing water detected by ulf BCG systems. The slope or area summation of the absolute velocity forms also correlates with the rise or fall in the flow cardiac index before and after exercise. The physical equations to calculate bed motions effected by a rotating mass are considered to be dependable. F.R.L.

#### A70-12678

**THE RELATION BETWEEN BALLISTOCARDIOGRAM FORCE ENVELOPES AND PULSE PRESSURE.**

M. Steffin and J. Nyboer (Wayne State University, School of Medicine, Detroit, Mich.).

IN: BALLISTOCARDIOGRAPHY AND CARDIOVASCULAR PERFORMANCE; BALLISTOCARDIOGRAPH RESEARCH SOCIETY, ANNUAL MEETING, 13TH, ATLANTIC CITY, N.J., MAY 4, 1968, PROCEEDINGS. (A70-12675 02-04)

Edited by Isaac Starr.

Basel, Switzerland, S. Karger AG (*Bibliotheca Cardiologica*, no. 24), 1969, p. 13-17.

Comparison of the performance of the counterforce ballistocardiograph with that of highly compliant ballistocardiographs, noting that the form of the force functions, especially as rendered by the counterforce system, bears a resemblance to an amplitude-modulated carrier, the "carrier" frequency being approximately 5 Hz. This form may be the result of perturbation of viscoelastic networks coupling the cardiovascular system to the ballistic bed. An analog computer is described which derives the envelope of the force function, and records are presented to show that the waveform of this envelope resembles that of the pulse pressure function. F.R.L.

#### A70-12679

**THE EFFECT OF A RIGID SUPPORT ON THE ULTRA-LOW FREQUENCY BALLISTOCARDIOGRAM.**

P. D. Verdouw, C. Ambrosi, T. Iwazumi, and A. Noordergraaf (Pennsylvania University, Philadelphia, Pa.).

IN: BALLISTOCARDIOGRAPHY AND CARDIOVASCULAR PERFORMANCE; BALLISTOCARDIOGRAPH RESEARCH SOCIETY, ANNUAL MEETING, 13TH, ATLANTIC CITY, N.J., MAY 4, 1968, PROCEEDINGS. (A70-12675 02-04)

Edited by Isaac Starr.

Basel, Switzerland, S. Karger AG (*Bibliotheca Cardiologica*, no. 24), 1969, p. 45-50.

PHS Grants No. HE-10, 330-03; No. HE-625-19.

Theoretical and experimental study of the effect of the properties of the support on deformation of the ulf ballistocardiogram. It is shown that the use of a 7-kg rigid and smooth surface without a footboard has a significant detrimental effect on the quality of the recorded curves. It has also become apparent in which way the coupling between subject and support can be improved to such a level that it is comparable with the degree of coupling obtained when the subject is supported by canvas stretched out in a metal frame while utilizing a footboard. F.R.L.

#### A70-12680

**REPRODUCIBILITY OF FORM READINGS OF STARR AND ULTRA LOW FREQUENCY BALLISTOCARDIOGRAMS.**

R. W. Sherwin, W. K. Harrison, F. W. Davis, and B. M. Baker (Johns Hopkins University, School of Medicine, Dept. of Medicine, Baltimore, Md.).

IN: BALLISTOCARDIOGRAPHY AND CARDIOVASCULAR PERFORMANCE; BALLISTOCARDIOGRAPH RESEARCH SOCIETY, ANNUAL MEETING, 13TH, ATLANTIC CITY, N.J., MAY 4, 1968, PROCEEDINGS. (A70-12675 02-04)

Edited by Isaac Starr.

Basel, Switzerland, S. Karger AG (*Bibliotheca Cardiologica*, no. 24), 1969, p. 51-56.

PHS Grant No. GM-10895.

Results of a study to determine the extent of the variation among and within experienced readers of Starr and ulf ballistocardiograms. Three readers interpreted and applied the Starr criteria with considerable uniformity in each of 35 patients with coronary heart disease. It is concluded that no important increase in precision is likely to result from routine multiple readings by one or more observers. The ulf records showed, on the average, a somewhat greater degree of abnormality than the Starr records, but this was not necessarily true for any individual patient. F.R.L.

#### A70-12681

##### THEORETICAL VERIFICATION OF ISAAC STARR'S FORMULA FOR THE CALCULATION OF STROKE VOLUME.

K. Burkhart (Bundesministerium der Verteidigung, Luftwaffe, Flugmedizinisches Institut, Fürstentfeldbruck, West Germany).

IN: BALLISTOCARDIOGRAPHY AND CARDIOVASCULAR PERFORMANCE; BALLISTOCARDIOGRAPH RESEARCH SOCIETY, ANNUAL MEETING, 13TH, ATLANTIC CITY, N.J., MAY 4, 1968, PROCEEDINGS. (A70-12675 02-04)

Edited by Isaac Starr.

Basel, Switzerland, S. Karger AG (*Bibliotheca Cardiologica*, no. 24), 1969, p. 57-62.

Attempt to derive a theoretical formula for stroke volume, depending on well-known parameters and constants such as blood density and average viscosity. The study indicates that the law of Hagen-Poiseuille, based on the concept of replacing a pressure wave by a current impulse, cannot be applied to ballistocardiography. The theoretical value of stroke volume has been verified experimentally. F.R.L.

#### A70-12682

##### CORRELATIONS BETWEEN AGE, 'STROKE VOLUME INDEX', AND THE 'MINUTE VOLUME INDEX' OF SCARBOROUGH.

R. Proper (Lovelace Foundation for Medical Education and Research, Dept. of Diagnostics and Clinical Biometrics; New Mexico, University, School of Medicine, Albuquerque, N. Mex.).

IN: BALLISTOCARDIOGRAPHY AND CARDIOVASCULAR PERFORMANCE; BALLISTOCARDIOGRAPH RESEARCH SOCIETY, ANNUAL MEETING, 13TH, ATLANTIC CITY, N.J., MAY 4, 1968, PROCEEDINGS. (A70-12675 02-04)

Edited by Isaac Starr.

Basel, Switzerland, S. Karger AG (*Bibliotheca Cardiologica*, no. 24), 1969, p. 63-65.

NIH Grant No. PH-00518.

Up-to-date compilation of correlations between chronological age and ballistocardiographic modalities. The subjects represent some 400 professional pilots ranging in age from 20 to 78 with no historical or clinical evidence of cardiovascular disease. Present observations of observed and derived data from the ulf ballistocardiogram suggest that the best correlations are made when the independent variable of chronologic age is correlated against the dependent variable of 'IJ amplitude. F.R.L.

#### A70-12683

##### STUDIES ON A SMALL GROUP OF NORMAL TEST PILOTS WITH SPECIAL REFERENCE TO QUANTITATIVE RELATION-

##### SHIPS OF AGE WITH THE ULF BALLISTOCARDIOGRAM AND OTHER CARDIOVASCULAR MEASUREMENTS.

W. R. Scarborough (U.S. Public Health Service, National Institutes of Health, Div. of Research Grants, Bethesda, Md.), E. E. Westura (Federal Aviation Administration, Georgetown Clinical Research Institute, Washington, D.C.), and E. Podolak (Federal Aviation Administration, Office of Aviation Medicine, Aeromedical Application Div., Washington, D.C.).

IN: BALLISTOCARDIOGRAPHY AND CARDIOVASCULAR PERFORMANCE; BALLISTOCARDIOGRAPH RESEARCH SOCIETY, ANNUAL MEETING, 13TH, ATLANTIC CITY, N.J., MAY 4, 1968, PROCEEDINGS. (A70-12675 02-04)

Edited by Isaac Starr.

Basel, Switzerland, S. Karger AG (*Bibliotheca Cardiologica*, no. 24), 1969, p. 66-74. 6 refs.

Results of intensive, multidisciplinary physiological studies carried out on 28 test pilots ranging in age from 35 to 56. The battery of tests included the recording of ulf acceleration, velocity, and displacement ballistocardiograms (BCGs) simultaneously with related cardiovascular variables at rest during normal and suspended respiration. Manual measurements of BCG wave amplitudes and time intervals were made, waveforms were classified, and certain derived BCG values were computed. The most striking results of the BCG studies were strong correlations of BCG amplitudes (negative) and waveform grades (positive) with age, in spite of the limited sample size and age span. F.R.L.

#### A70-12684

##### ANALYSIS OF THE EFFECT OF POSTURE ON THE BCG.

P. D. Verdouw, N. Westerhof, and A. Noordergraaf (Pennsylvania, University, Moore School of Electrical Engineering, Dept. of Biomedical Engineering, Philadelphia, Pa.).

IN: BALLISTOCARDIOGRAPHY AND CARDIOVASCULAR PERFORMANCE; BALLISTOCARDIOGRAPH RESEARCH SOCIETY, ANNUAL MEETING, 13TH, ATLANTIC CITY, N.J., MAY 4, 1968, PROCEEDINGS. (A70-12675 02-04)

Edited by Isaac Starr.

Basel, Switzerland, S. Karger AG (*Bibliotheca Cardiologica*, no. 24), 1969, p. 75-84. 12 refs.

PHS Grant No. HE-10, 330-03.

Attempt to gain some insight into the influence of variables which may account for differences in ballistocardiograms in supine and sitting positions. An electrical analog of the arterial trees was used. The method of recording is briefly described. The experiments lead to the conclusion that the differences in BCGs recorded in supine and sitting position are mainly due to changes in ventricular ejection flow. Distensibility, peripheral resistance, and heart rate can vary within fairly wide limits without affecting the (A- and V-) BCG directly in a significant manner. If such changes in distensibility, peripheral resistance, and/or heart rate, however, modify left ventricular outflow, the A-BCG especially proves to be highly susceptible for such a change in left ventricular ejection. The acceleration of blood in the root of the aorta during the early part of the ejection proves to be linear with the amplitude of the I wave. F.R.L.

#### A70-12695 \*

##### CELL SORTING-AUTOMATED SEPARATION OF MAMMALIAN CELLS AS A FUNCTION OF INTRACELLULAR FLUORESCENCE.

H. R. Hulett, W. A. Bonner, Janet Barrett, and Leonard A. Herzenberg (Stanford University, School of Medicine, Dept. of Genetics, Stanford, Calif.).

*Science*, vol. 166, Nov. 7, 1969, p. 747-749. 6 refs.

NIH Grants No. AI-08917-06; No. CA-04681-10; Grant No. NGR-05-020-004.

Description of successful experiments in which intracellular fluorescence developed after exposure to the fluorogenic esterase substrate, fluorescein diacetate, was used as a parameter for directed

sorting of cultured Chinese hamster ovarian tumor cells from mouse spleen cells and for concentration of antibody-producing hemolytic plaque-forming cells from spleens of mice sensitized to sheep red blood cells. Highly fluorescent cell fractions separated by this technique from mouse spleen cells immunized to sheep erythrocytes were enriched in antibody-producing cells by factors ranging from 4 to 10. V.Z.

## A70-12696

## SIMULATION OF ATRIAL FLUTTER BY RAPID CORONARY SINUS PACING.

Kenneth M. Rosen, Sun H. Lau, and Anthony N. Damato (U.S. Public Health Service, Hospital, Cardiopulmonary Laboratory, Staten Island, N.Y.).

*American Heart Journal*, vol. 78, Nov. 1969, p. 635-642. 33 refs. PHS-supported research; NIH Grants No. HE-11829; No. HE-112536.

Results of a study in which an arrhythmia resembling atrial flutter was produced in dogs by coronary sinus and left atrial pacing, and in man by rapid pacing of the coronary sinus. In five human subjects and seven canines the coronary sinus was placed at rates of 250 to 350 per minute using an electrode catheter. Two of the dogs were similarly paced from the inferior left atrium. An arrhythmia was produced with the following electrocardiographic characteristics: (1) continuous atrial activity with P waves identical in spacing, size, and contour; (2) a suggestion of base-line undulation, often with a sawtooth configuration; and (3) varying degrees of A-V block. A unifocal atrial tachycardia was produced that resembles atrial flutter. Some cases of clinical atrial flutter may originate as a unifocal tachycardia emanating from the coronary sinus or left atrium. F.R.L.

## A70-12697

## AORTIC FLOW VELOCITY IN MAN DURING CARDIAC ARRHYTHMIAS MEASURED WITH THE DOPPLER CATHETER-FLOWMETER SYSTEM.

Alberto Benchimol, H. Fred Stegall, Peter R. Maroko, John L. Garthan, and Leib Brener (Good Samaritan Hospital, Institute for Cardiovascular Diseases, Phoenix, Ariz.).

*American Heart Journal*, vol. 78, Nov. 1969, p. 649-659. 27 refs. Research supported by the Arizona Heart Association and the Southwest Foundation for Medical Research and Education; NIH Grant No. HE-11131.

Discussion of the applicability of a technique developed by Stegall et al. (1967), who used a Doppler flowmeter-catheter system to record aortic flow velocity in dogs, to the study of aortic flow velocity in man. The normal pattern of aortic flow velocity and its alterations in patients with a variety of cardiac arrhythmias is described. The arrhythmias examined in 33 patients included atrial fibrillation, spontaneous and pacemaker-induced atrial and ventricular tachycardias, atrial and ventricular extrasystoles, and complete heart block. Factors which regulate stroke volume—i.e., ventricular volume and the influence of previous contractions—are discussed in the light of the observations. It is suggested that the device may be used with caution to study instantaneous phasic aortic flow velocity in conscious man. F.R.L.

## A70-12763

## BIOLOGICAL RHYTHM DISORDERS DURING AIR AND SPACE TRAVEL (LES TROUBLES DES RYTHMES BIOLOGIQUES EN AVIATION ET EN COSMONAUTIQUE).

Ph. Chemin (Bordeaux, Université, Faculté de Médecine, Bordeaux, France).

*Forces Aériennes Françaises*, vol. 24, Oct. 1969, p. 329-344. In French.

Discussion of disturbances in the biological rhythms of astronauts due to physical environmental factors. The difficulty of

adaptation to new sleeping habits imposed by the U.S. space flights is discussed. It is pointed out that some astronauts sleep as soundly in orbit as they do on the earth. A low degree of alertness seems to exist under weightlessness conditions. Accounts of space flights point to the existence of a slight lowering in physical tone, and to a tendency to drowsiness and prolonged sleep resulting in distraction and errors. A break in the routine wakefulness-sleep cycle poses adaptation problems. M.M.

## A70-12770

## INFLUENCE OF A SIX-HOUR IMMERSION IN THERMOINDIFFERENT WATER ON CIRCULATORY CONTROL AND WORK CAPACITY IN TRAINED AND UNTRAINED SUBJECTS (DER EINFLUSS EINER 6STÜNDIGEN IMMERSION IN THERMOINDIFFERENTEM WASSER AUF DIE REGULATION DES KREISLAUFS UND DIE LEISTUNGSFÄHIGKEIT BEI TRAINIERTEN UND UNTRAINIERTEN).

Jürgen Stegmann, Heinz-Dieter Framing, and Michael Schiefeling (Deutsche Sporthochschule, Physiologisches Institut, Cologne, West Germany).

*Pflügers Archiv*, vol. 312, no. 4, 1969, p. 129-138. 18 refs. In German.

Study of the effect of a 6-hr immersion in thermoindifferent water on circulatory control, by means of a tilt table in four trained and four untrained subjects. The maximum aerobic capacity, the Müller's (1950) performance-heart-rate index, and the maximum voluntary force of a muscle group were determined before and after immersion. It is found that the untrained subjects tolerated a period of 10 min in a vertical position in both cases without abnormal

effects. After immersion, all trained subjects fainted, showing symptoms of a vagovasal syncope, within a period of 6.1 plus or minus 1.8 min after being placed into vertical position. It was possible to prevent fainting by oral application of Atropin half an hour before the tilt-table test was performed. After immersion, in both groups the heart rate showed remarkable wavy oscillations with periods of 12 and 60 sec. In the trained group this effect was more pronounced. Z.W.

## A70-12771

RELEASE-RECOVERY PHENOMENON IN FROG HEART MUSCLE AT VARIOUS  $Ca^{++}$  CONCENTRATIONS AND TEMPERATURES (DAS RELEASE-RECOVERY-PHÄNOMEN AM HERZMUSKEL DES FROSCHES BEI VARIERTEN  $Ca^{++}$ -KONZENTRATIONEN UND TEMPERATUREN).

E. Rumberger and B. Schwartz (Hamburg, Universität, Physiologisches Institut, Hamburg, West Germany).

*Pflügers Archiv*, vol. 312, no. 4, 1969, p. 149-160. 28 refs. In German.

Study of the dynamic stiffness and release-recovery phenomenon using frog heart strips at different calcium-ion concentrations and temperatures, by means of a quick-release technique. It is found that the dynamic stiffness depends only to a very small extent on the calcium-ion concentration and is practically independent of temperature. It depends mainly on the muscle tension. The recovery force is composed of two components: a passive component and an active component which is dependent on and induced by calcium ions. The amplitude of the recovery phenomenon is the arithmetic sum of both components. Z.W.

## A70-12797 #

## EFFECT OF VARIOUS AMINO ACIDS ON THE GROWTH OF GREEN CHLOROBIVUM THIOSULFATOPHILUM SULFUR BACTERIA IN RELATION TO THE ILLUMINATION CONDITIONS AND TO THE PRESENCE OF AMMONIUM CHLORIDE IN THE MEDIUM (VLIJANIE RAZLICHNYKH AMINOKISLOT NA ROST ZELENYKH SEROBAKTERII CHLOROBIVUM THIOSULFATOPHILUM V ZAVISIMOSTI OT NALICHIIA V SREDE KHLORIS-TOGO AMMONIIA I USLOVII OSVESHCHENIIA).

V. D. Fedorov, A. A. Belousova, and V. N. Maksimov (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR).

*Akademiia Nauk SSSR, Izvestiia, Serii Biologicheskaiia*, Sept.-Oct. 1969, p. 694-704. 12 refs. In Russian.

Study of the growth of *Chlorobium thiosulfatorium* bacteria, exposed to light of 150 or 1000 lux, on media containing various combinations of proline, asparagine, glutamic acid, arginine, valine, and nor-leucine with or without addition of 1500 mg/l ammonium chloride. It is found that proline and asparagine in the absence of ammonium chloride are used by the bacteria as a nitrogen source when the illumination level is 150 lux. On the other hand, in the presence of ammonium chloride these amino acids are used by the bacteria primarily as a carbon source. Valine additions in the absence of ammonium chloride under illumination of 150 lux as well as in the presence of ammonium chloride under illumination of 1000 lux decrease the green mass yield. V.Z.

## A70-12798 #

## PHYSIOLOGICAL EQUIVALENTS OF AIR (FIZIOLOGICHESKIE EKIVALENTY VOZDUKHA).

V. P. Nikolaev (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR).

*Akademiia Nauk SSSR, Izvestiia, Serii Biologicheskaiia*, Sept.-Oct. 1969, p. 730-735. 16 refs. In Russian.

Outline of a concept according to which the physiological effect of certain artificial gas media is equivalent to that of air at normal pressure when these media provide a normal oxygen intake in the organism and have the density of air at 760 mm Hg. A mathematical formulation is developed for criteria of a physiological equivalent of air for Kr, Xe, Ar, Ne, He, and H as substitute for nitrogen in inhaled gas mixtures. Physiological equivalents of air are obtained for pressures ranging from 0.39 to 11.3 atm. It is shown theoretically that the basic processes of the gas metabolism in such mixtures have the same patterns as in air at sea level. V.Z.

## A70-12799 #

## STATOKINETIC REACTIONS OF MAN UNDER CONDITIONS OF BRIEF WEIGHTLESSNESS (STATOKINETICHESKIE REAKTSII CHELOVEKA V USLOVIAKH KRATKOVREMENNOI NEVESOMOSTI).

I. A. Kolosov.

*Akademiia Nauk SSSR, Izvestiia, Serii Biologicheskaiia*, Sept.-Oct. 1969, p. 736-741. 16 refs. In Russian.

Study of the sensor, vegetative, motor, and vestibulo-somatic reactions to repeated brief weightlessness in a group of 30 fighter pilots (with flying times from 300 to 2000 hr) and in a group of 11 laymen. Tests involved a total of 950 jet flights with a total of 3010 brief weightlessness conditions. The absence of disorders in these reactions is viewed as an indication of a high statokinetic stability of the organism. Adaptation to brief weightlessness was observed after 12 exposures in professional fighter pilots and after 30 exposures in laymen. It persisted for three to four months in the former and for two to three months in the latter. V.Z.

## A70-12824

## CROSS-ADAPTATION.

Henry B. Hale (USAF, School of Aerospace Medicine, Brooks AFB, Tex.).

*Environmental Research*, vol. 2, Oct. 1969, p. 423-434. 86 refs.

Brief discussion of results obtained in cross-adaptation studies. The results show that cross-adaptations are highly variable and that negative and positive cross-adaptations can coexist. While adaptation patterns of change have been worked out for a great number of physiologic functions, cross-adaptation patterns and principles remain to be determined. The results obtained for heat-adapted, altitude-adapted, and cold-adapted animals subjected to acute heat exposure are tabulated, together with the results obtained for

heat-adapted, altitude-adapted, and laboratory-adapted animals subjected to acute cold exposure. It is emphasized that cross-adaptation is an aspect of environmental physiology that has been studied inadequately. The available literature on cross-adaptation, although meager, shows that research in this area will be fruitful. M.M.

## A70-12825 \*

## COMMENTS ON CROSS-ADAPTATION.

Melvin J. Fregly (Florida, University, College of Medicine, Gainesville, Fla.).

*Environmental Research*, vol. 2, Oct. 1969, p. 435-441. 11 refs.

Grant No. NSG-542.

Discussion of criteria for evaluating cross-adaptation, and classification of adaptations. Methods for the study of cross-adaptation or cross-acclimation are briefly reviewed, and some modifications in physiologic and biochemical processes which have been studied in man and other mammals chronically exposed to cold air and to hypoxia are tabulated. A positive cross-acclimation has been demonstrated between the development of hypertension and exposure to hypoxia. A collation and correlation of the presently available responses or strains for given intensities of the various stresses will provide a beginning basis for predicting whether cross-acclimation will be positive or negative. M.M.

## A70-12839

## EXPLANATIONS OF THE HORIZONTAL-VERTICAL ILLUSION AND THE FORESHORTENING OF RECEDING HORIZONTALS.

B. G. Stacey (Strathclyde, University, Dept. of Psychology, Glasgow, Scotland).

*Life Sciences, Part II—Biochemistry, General and Molecular Biology*, vol. 8, Nov. 15, 1969, p. 1237-1246. 21 refs.

Discussion of several explanations for the horizontal-vertical illusion and the foreshortening of receding horizontal lines occurring during visual observations. Special attention is given to (1) the visual field explanation of Kunnapas (1959), (2) the perceptual activities explanation of Piaget (1969), and (3) the foreshortening of receding horizontals hypothesis, first stated by Hering and Lipps, and more recently proposed by Segall, Campbell, and Herskovits (1966). Z.W.

## A70-12850 #

## DIAGNOSTIC VALUE OF PERIODIC ELECTROCARDIOGRAM RECORDINGS UNDER HYPOXIA CONDITIONS (O DIAGNOSTICHESKOM ZNACHENII PERIODICHESKOI REGISTRATSII ELEKTROKARDIOGRAMMY V USLOVIAKH GIPOKSII).

M. D. Viadro, S. F. Raev, and N. P. Ponomarev.

*Voenna-Meditsinskii Zhurnal*, Sept. 1969, p. 53-56. In Russian.

Discussion of the importance of intermittent EKG recordings at 3 to 5 min intervals during the entire time of a depressurized chamber test for the detection and diagnostics of potential heart disorders in airmen. Several medical test examples are described to demonstrate that the diagnostic value of such recordings is higher than that of a routine procedure with only three EKG recordings taken (1) before depressurization, (2) 7 to 10 min after the beginning of depressurization, and (3) under normal pressure after the test. It is concluded that the hypoxia tolerance can be better evaluated when EKGs are taken continuously. V.Z.

## A70-12865 \*

## EFFECTS OF ALTITUDE ON BROWN FAT AND METABOLISM OF THE DEER MOUSE, PEROMYSCUS.

Jane C. Roberts (California, University, Dept. of Biological Sciences, Santa Barbara, Calif.), Raymond J. Hock (Northrop Corp., Northrop Corporate Laboratories, Hawthorne, Calif.), and Robert E. Smith (California, University, School of Veterinary Medicine, Dept. of Physiological Sciences, Davis, Calif.).

*Federation Proceedings*, vol. 28, May-June 1969, p. 1065-1072. 34 refs.

PHS Grant No. HD-01826; Grants No. NGR-05-004-035; No. DA-DA-17-68-C-8064.

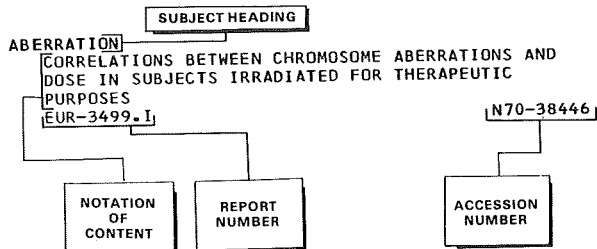
Study of the effect of changes in altitude on the brown fat content and metabolism in groups of deer mice translocated from their sea-level habitat to an altitude of 3800 m above sea level and vice versa. The temperature of the animal quarters was kept constant at 25 to 26 deg C at both altitudes in an attempt to separate the effect of hypoxia from that of cold. The results suggest that high-altitude native deer mice may be cold-adapted with respect to both the mass and the in vitro oxygen consumption of brown fat but that hypoxia may limit the brown fat heat production even under the natural cold conditions of high altitude.

V.Z.

# Subject Index

AEROSPACE MEDICINE AND BIOLOGY / a continuing bibliography FEBRUARY 1970

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Book on chemical evolution of life covering molecular paleontology, prebiotic chemistry, membrane structures, molecular evolution and structure, etc

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Arterial pressure pulse waves mathematical analysis applied to variations in stroke volume in anesthetized dogs subjected to spine-to-breast accelerations

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Space or atmospheric flight caused or aggravated ophthalmic lesions, noting retinal and conjunctival hemorrhages from barometric pressure fall and rapid acceleration and deceleration

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Chicken body mass and percentage body fat following 24 weeks chronic acceleration determined from fatty acid metabolism, liver citrate cleavage and malic enzyme activities

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Acid base responses of arterial plasma of anesthetized man during acute carbon dioxide partial pressure changes, discussing anesthesia effects

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Neurons tracing activity and cellular memory mechanisms in cortical projection region of cutaneous analyzer of immobilized rats following electric acoustic stimuli

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### ACTIVITY CYCLES (BIOLOGY)

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Programming P hypothesis for REM sleep state in higher animal adaptive behavior process

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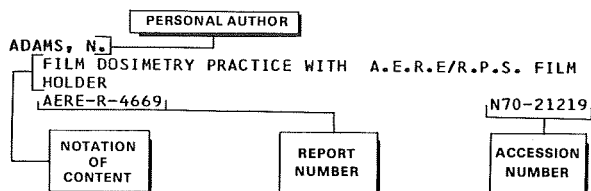
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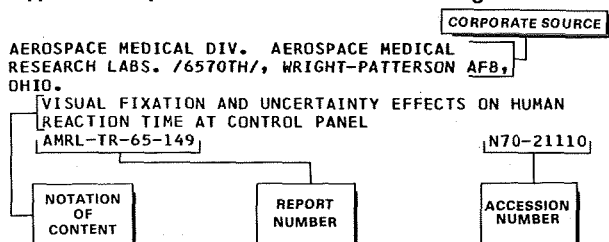
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